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NATIONAL COMPUTER SYSTEMS LABORATORY

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NATIONAL INSTITUTE OF STANDARDS &
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Research Information Center
Gaithersburg, MD 20899

ANNUAL REPORT 1990

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December 1990

U.S. Department
of Commerce
Robert A. Mosbacher,
Secretary

National Institute
of Standards and
Technology
John W. Lyons,
Director

National Computer
Systems Laboratory
James H. Burrows,
Director

NATIONAL COMPUTER SYSTEMS LABORATORY

United States Department of Commerce
National Institute of Standards and Technology

DIRECTOR'S FOREWORD

In the 1990s, we will have an exceptional opportunity to capitalize on the advances in information technology that have taken place over the past forty years. Technology changes have led to powerful desktop workstations, supercomputers, high-speed communications links, and many automated applications. Computing is being decentralized and distributed geographically throughout a business or enterprise. However, there are still limitations on our ability to communicate between processes, and to integrate the information processed by computers, word processors, industrial robots, bank terminals, and other automated activities.

The National Computer Systems Laboratory continues to develop the standards and technology that will be needed to overcome these barriers and to move to open computer systems in the 1990s. This report describes NCSL's work over the past year to help government and industry increase their productive use of computer systems and to improve the security, accuracy, and consistency of the information processed by computer systems.

Building on our past efforts, we continued to work with vendors and users to develop Open Systems Interconnection (OSI), Integrated Services Digital Network (ISDN), Portable Operating System Interface for Computer Environments (POSIX), and other technologies needed for open systems. We also worked closely with federal agencies to apply and integrate these technologies into advanced systems based on standards. For example, we have been supporting the Department of Defense's Computer-aided Acquisition and Logistic Support (CALS) program for the integration of digital information related to weapon system design, manufacture, and support.

Implementation of the Computer Security Act of 1987 was a major focus as we wrapped up the review of agency computer security plans that were mandated by the legislation. We have been exploring new approaches to assisting users through direct help and consultation, forums, information clearinghouses, and information outreach and exchange programs. The international aspects of computer security were underscored this year as we initiated a cooperative activity with European governments to develop common international criteria for evaluating the security of computer systems.

OSI, ISDN, and POSIX are components of open system environments that will integrate different systems, applications, and data. New forces are at work to bring about the transition to open systems, a change that will influence the development of future systems. Users are beginning to organize and to communicate their requirements to vendors and to standards makers for interoperable software, hardware, and communications products. Users want to preserve their investments in software, staff skills, and data, and to reduce their dependence on single sources of supply for information technology products and services.

Vendors are beginning to take notice of this drive by the users. This is a new strategy on the part of many vendors who in the past built their product lines to limit, rather than to expand, the interoperability of their systems with those of other manufacturers.

Within the federal government, we see a need for a unified approach to open systems architectures by our users. With the support of the Office of Management and Budget, we have formed a Federal Open System Users Council composed of senior-level government executives. The council will develop common architectural frameworks for open systems to meet government requirements for interconnection and interoperation of systems from different vendors and for the portability of software.

We expect that the council will develop and maintain liaison with other user organizations, with vendors and with vendor-sponsored groups, as well as with the formal standards organizations. The Federal Open System Users Council will be a mechanism for the federal government to fashion new and better relationships between users and vendors, and to promote better understanding of common requirements.

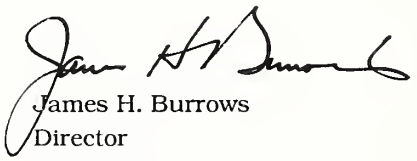
The communication of common requirements will help to nurture large world markets for open systems. Such large markets will benefit both users and vendors by stimulating competition and creating the opportunities for large, long-term investments. However, as new products based on open systems concepts become available, users will be challenged to plan for the transition and to migrate to new systems. Old systems in which users have made big investments will continue to be used.

Over the next few years, NCSL expects to address many urgent open systems issues. Technology and standards will be needed for high-speed digital communications. We look ahead to the development of fiber optic links or "information superhighways" with capabilities for transmitting gigabits per second. Such capabilities will foster the sharing of research results and data, improve communications between automated activities, and facilitate cooperative relationships among government, industry, and research organizations.

We also will address the conformance testing needed for open systems. Tests are an important factor in user acceptance of open systems and in the evolution of dependable products. Tools will be needed for integrating complex systems in open environments and assuring the interoperability that users need and want. We will need complex tests for entire systems, including network management and security. This is an area where international cooperation will be essential to assure that timely and internationally recognized tests of high quality are developed. Our goal is to arrive at common solutions that serve both users and vendors who want to compete in an international marketplace.

Another goal is to develop the standards and technology to protect the confidentiality, integrity, and availability of the information as organizations create interoperable global networks for electronic mail, business data interchange, and other strategic business functions. Security in open systems will be a formidable challenge that must be addressed through the cooperative efforts of many organizations.

I invite you to review the activities detailed in this report, and help us move forward to achieve better information systems for the 1990s and the 21st century.



James H. Burrows
Director
National Computer Systems Laboratory

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OVERVIEW OF NATIONAL COMPUTER SYSTEMS LABORATORY

The National Computer Systems Laboratory (NCSL) is one of the major science and engineering research components of the National Institute of Standards and Teehnology (NIST) of the U.S. Department of Commerce. The laboratory develops standards and test methods, conducts research on computer and related telecommunications systems, and provides technical assistance to government and industry. The Brooks Act (Public Law 89-306) and the Computer Security Act of 1987 (Public Law 100-235) mandate NCSL's programs which seek to overcome barriers to the efficient use of computer systems, to the cost-effective exchange of information, and to the protection of valuable information resources in computer systems.

The Computer Security Act strengthened the laboratory's role in protecting federal information assets, assigning NCSL a leadership role for developing standards, guidelines, and technology for computer systems security throughout the federal community (excluding classified and certain unclassified, national-security-related systems). To accomplish this goal, NCSL provides federal agencies with advice and assistance in planning computer security programs, increases awareness at all levels of agency management, and publishes guidance to help agencies carry out computer security training requirements established by the legislation.

NCSL's technical work is carried out in five divisions: Information Systems Engineering Division, Systems and Software Technology Division, Computer Security Division, Systems and Network Architecture Division, and Advanced Systems Division. In FY 1990, NCSL staffing resources included 231 full-time-equivalent employees, of which about 75% were professional and technical personnel and 25% were administrative and support staff. Our professional staff consisted primarily of computer scientists, computer specialists, electrical and electronic engineers, and mathematicians. In addition, 26 guest scientists and research associates from industry, academia, and the international community collaborated in our laboratory research effort.

Funding for NCSL's programs in FY 1990 included $10.6 million from the NIST Congressional appropriation (STRS), of which $.9 million came from NIST-supported competency funding, and $11.9 million in reimbursable funds for direct technical support to the federal community. About 35 government and industry organizations received technical assistance from NCSL in FY 1990. The Department of Defense, the Department of Veterans Affairs, and the Department of the Treasury were among the agencies which used NCSL's resources to solve technical problems in their computer systems and networks. These and other agencies have benefitted from our technical expertise through increased productivity, reduced costs, and enhanced computer security.

NCSL continued its support of national and international standards development organizations and of industry and user consortia that contribute to the development and implementation of standards. The laboratory participates in this process to ensure that emerging standards meet the needs of the federal government for applications portability and the interoperability of the many components of today's computer systems. The Federal Information Processing Standards (FIPS) developed and revised by NCSL ensure that federal agencies enjoy increased flexibility and reduced costs in the computer systems they acquire.

NCSL's ongoing laboratory-based research program continued in 1990 to advance the goals of the organization. The development of tests and measurement methods to evaluate conformance of products to FIPS remained a critical part of the laboratory's program. Technology transfer to government and industry completed the research cycle.

The implementation of the Computer Security Act entered a new phase this year with the completion of the joint NIST/National Security Agency (NSA) review of federal agency computer security plans. NCSL and NSA joined the Office of Management and Budget (OMB) in initiating a series of visits to federal agencies to provide technical advice and assistance on computer security. OMB mandated the visits in OMB Bulletin 90-08, "Guidance for Preparation of Security Plans for Federal Computer Systems that Contain Sensitive Information." Agency visits will continue next year. The Computer System Security and Privacy Advisory Board (CSSPAB), a 13-member advisory group which identifies emerging computer security issues, met three times in 1990 and issued letters on the draft European *Information Technology Security Evaluation Criteria* and several other computer security issues. NCSL also established the Integrated OSI, ISDN, and Security Broad Agency Announcement Program, a cooperative effort bringing together the resources of federal and private organizations to provide a testbed for the development of prototype systems in these three important areas of information technology.

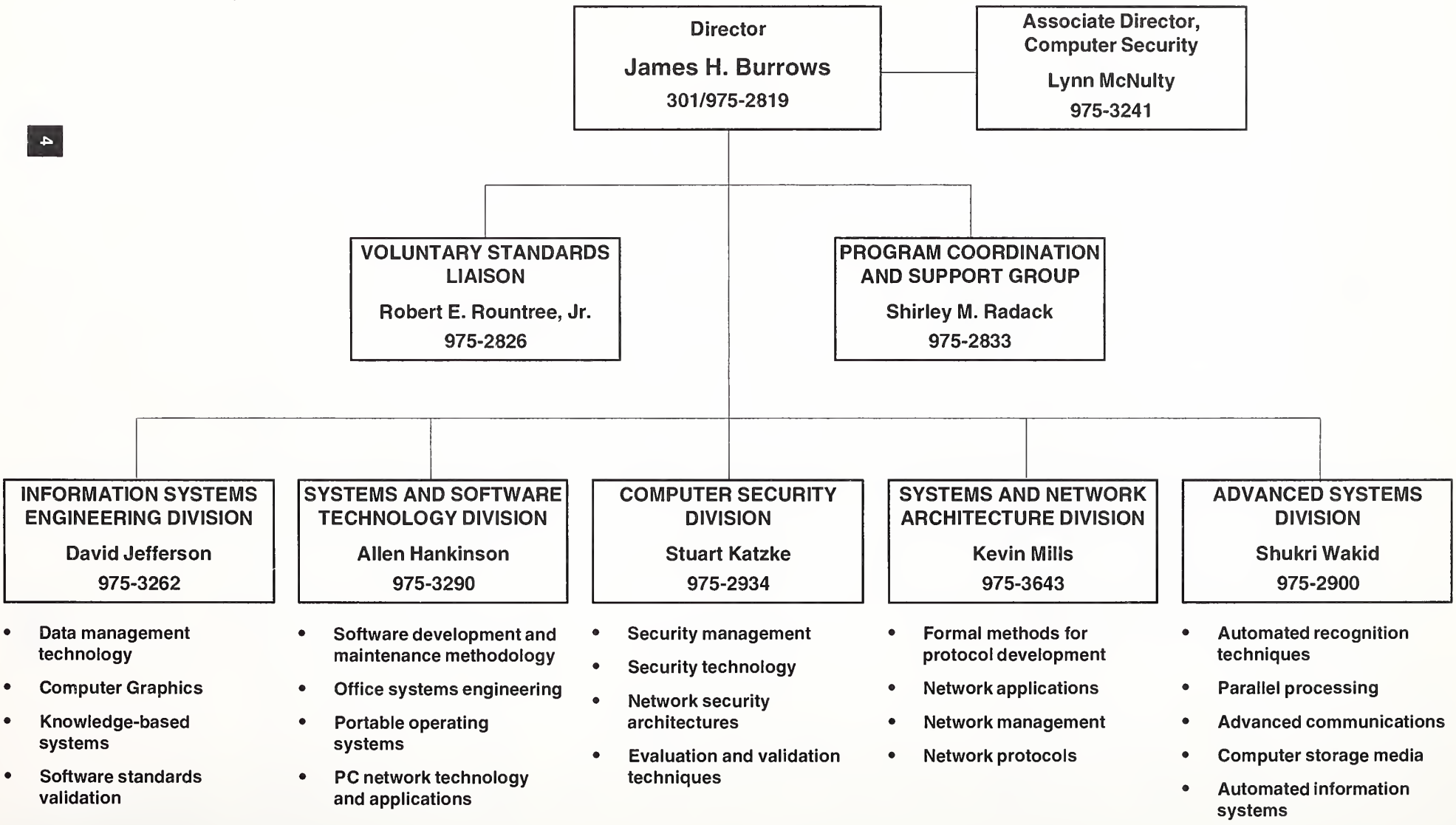
NCSL shares information and technology with the federal and private-sector communities through a wide range of publications. A new NCSL Bulletin series was launched to present an in-depth discussion of a single topic of significant interest to the information systems community. Five bulletins were issued in 1990 on computer security topics. The quarterly newsletter "NCSL" focuses on standards activities, research results, new publications, and upcoming technical conferences. More than 140 FIPS and several hundred other reports published by NCSL are available through the National Technical Information Service or the Government Printing Office. See the Technology Transfer section of this report for a list of recent Special Publication 500 (computer systems publications) and 800 (computer security publications) series, NISTIRs (interagency reports), and the complete list of FIPS currently available.

Also contained in the Technology Transfer section is information on recent conferences, workshops, and organizations where NCSL staff were invited to give talks. Major conferences in 1990 included the annual National Computer Security Conference and an International Conference on the Application of Standards for Open Systems. Workshop series continued on the Portable Operating System Interface for Unix (POSIX) standard and the Applications Portability Profile/Open Systems Environment (APP/OSE), Open Systems Interconnection (OSI), and Integrated Services Digital Network (ISDN). Staff members participated in hundreds of talks and briefings to federal officials, professional societies, and user groups.

Computer users with dial-up capability may access any of the four electronic bulletin boards operated by NCSL. Bulletin boards are operated for information exchange in the following areas: computer security, data management, OSI, and ISDN. Details for accessing bulletin boards appear in Technology Transfer.

Overviews and technical highlights of our five divisions follow.

National Computer Systems Laboratory



- Data management technology
- Computer Graphics
- Knowledge-based systems
- Software standards validation

- Software development and maintenance methodology
- Office systems engineering
- Portable operating systems
- PC network technology and applications

- Security management
- Security technology
- Network security architectures
- Evaluation and validation techniques

- Formal methods for protocol development
- Network applications
- Network management
- Network protocols

- Automated recognition techniques
- Parallel processing
- Advanced communications
- Computer storage media
- Automated information systems

SELECTED STAFF ACCOMPLISHMENTS FY 1989 - FY 1990

Department of Commerce awards for major contributions to Department programs were presented to:

Roger J. Martin - Silver Medal

Miles E. Smid - Silver Medal

Barbara L. Blickenstaff - Bronze Medal

J. Elaine Frye - Bronze Medal

David R. Kuhn - Bronze Medal

Candice E. Leatherman - Bronze Medal

Charles L. Sheppard - Bronze Medal

Joan M. Sullivan - Bronze Medal

David Hui-Yang Su - Bronze Medal

James H. Burrows, NCSL Director, received the Distinguished Presidential Rank Award for extended exceptional performance in government.

James H. Burrows was inducted into the *Government Computer News* Hall of Fame.

James H. Burrows, Allen L. Hankinson, and **Dennis D. Steinauer** received the Federal 100 Reader's Choice Awards from *Federal Computer Week.*

Donna Harmon and Gerald Candela received the R&D 100 Award from *Research & Development* magazine for a fast information retrieval system.

Robert J. Carpenter, Alan Mink, George Nacht, and **John Roberts** received the Allen V. Astin Measurement Science Award for their contributions to the science of measuring the performance of multiprocessor computer systems.

Roger J. Martin received the Interagency Committee on Information Resources Management Award for Technical Excellence for outstanding contributions to the federal information resources management community.

Miles E. Smid received the Award for Technical Excellence from the Interagency Committee on Information Resources Management for his contributions to the federal information resources management community, particularly in computer security.

Leonard J. Gallagher received the Interagency Committee on Information Resources Management Award for Technical Excellence for outstanding contributions to the federal information resource management community.

Kevin L. Mills was appointed to represent NCSL on the new Federal Networking Council.

Miles E. Smid received the Commissioner's Citation from the Department of the Treasury for outstanding contributions to Treasury payments systems.

Mark Skall was reappointed to the National Computer Graphics Association Board of Directors.

Leonard J. Gallagher was selected by the Oracle Corporation as the grand prize winner of its "Unleash the Genius" contest for his implementation of a hypertext query facility.

Henry Tom was elected as the government representative on the Board of Directors of the National Computer Graphics Association.

Zella Ruthberg received the Tom Fitzgerald Award from the New York chapter of the Information Systems Security Association (ISSA) for contributions to the development of standards and guidelines for computer security.

INFORMATION SYSTEMS ENGINEERING DIVISION

The Information Systems Engineering Division develops standards and provides technical assistance to government and industry in data administration, data management technology, geographic information systems (GIS), computer graphics, and software standards validation.

Data Administration. NCSL continued to support the voluntary standards efforts concerning the Information Resource Dictionary System (IRDS), an American National Standards Institute (ANSI) standard that was adopted as Federal Information Processing Standard (FIPS) 156 in 1989. The IRDS is a software system that identifies information resources that can be shared within an organization. NCSL assisted in the development of an optional module to the IRDS standard, the Export/Import Format, that allows the exchange of information between different IRDS databases. Future efforts will focus on utilizing the IRDS as a mechanism to integrate the results produced through use of Computer-Aided Software Engineering (CASE) tools.

As part of the testing for the Export/Import Format module, NCSL updated and enhanced its IRDS prototype software. Included in the new edition is the ability to utilize the versioning capability specified in the IRDS standard. There are now over 200 users of this software in federal agencies, private industry, academia, and foreign countries.

The laboratory again co-sponsored the Data Administration Management Association (DAMA) symposium which focused on "Future Directions in Information Management." Interest in this conference continues to grow.

NCSL established a new working agreement with the Department of Defense (DoD) Corporate Information Management (CIM) initiative to provide data administration research in developing functional area models of DoD information processing. NCSL staff provided data administration training, evaluated potential CASE tool applications within CIM, and assisted in developing the CIM Process Guide.

Data Management Technology. A revised FIPS 127-1, Database Language SQL, was published in February 1990 and includes SQL integrity enhancements and embedded SQL. In an ongoing effort to help users and vendors determine compliance with FIPS 127-1, Version 2.0 of the NIST SQL Test Suite was released in December 1989. Over 42 SQL Test Suite licenses were added this fiscal year. In April 1990, the NIST SQL Validation Service opened using Version 2.0 of the NIST SQL Test Suite; a Registered Validation Report documents each validation.

A research project in Hypertext completed its second year in collaboration with the Systems and Software Technology Division. NCSL conducted two Hypertext workshops, one in October 1989 focusing on Hypertext applications and one in January 1990 addressing Hypertext standardization. Proceedings of the January workshop have been published as NIST Special Publication 500-178. A Hypertext Query Facility demonstration developed in the project received the Grand Prize in Oracle's Unleash the Genius Contest in April 1990.

Research efforts in object database management produced NIST Special Publication 500-179, *Object Database Systems: Concepts and Features*. This report reviews state-of-the-art object concepts and describes the major features of object database management systems. A second paper, "Use of the SQL and RDA Standards in Data Management," was accepted for publication in *Computer Standards and Interfaces*.

Under an interagency agreement, NCSL continued its assistance to the DoD Computer-aided Acquisition and Logistic Support (CALS) project in the application of SQL and other data management standards to CALS requirements. Technical assistance was also provided to the Department of the Treasury's Financial Management Service with their System 90 Project and to the Defense Medical Agency for physical database design.

Geographic Information Systems (GIS).

Geographic Information Systems continued as a major growth activity in 1990. Current projects in the GIS Standards Laboratory include the development of a GIS extension to the Database Language SQL, a GIS implementation of the IRDS, the coordination of a cross-reference between digital cartographic features, and the integration of GIS, expert systems, and object-oriented technology. NCSL installed a GIS Standards Laboratory electronic bulletin board to facilitate information exchange in GIS technology. Two GIS Standards Workshops conducted by NCSL during the past year were well attended and more workshops are planned. Future workshops will focus on the forthcoming FIPS Spatial Data Transfer Standard (SDTS), GIS data on CD-ROM technology, and integrating Global Positioning Satellite (GPS) technology with GIS.

Computer Graphics.

Conformance testing in computer graphics was another major growth area. NCSL promotes the protection of federal investment in computer graphics by developing conformance tests which determine whether implementations conform with FIPS and by establishing test services to administer conformance tests. Working closely with European colleagues ensures harmonization in computer graphics testing.

FIPS 120, Graphical Kernel System (GKS), added a requirement for implementations to be tested in order to be considered for procurement by federal agencies. NCSL subsequently established a test service for GKS implementations that are sold to the federal community. Also completed was Version 1 of the Programmer's Hierarchical Interactive Graphics System (PHIGS) Validation Test Suite. Version 2 will be completed in late summer 1991. NCSL also endorsed a Computer Graphics Metafile (CGM) Validation Test Suite to determine conformance to FIPS 128, CGM, and the CALS Application Profile (MIL-D-28003). The licensing of this test suite and establishing a test service for CGM are in process.

On the international scene, NCSL monitored the work taking place in Europe on CGI conformance testing. Also of note is the designation by the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) of NCSL as the Registration Authority for ISO Registration of Graphical Items. In this capacity, NCSL developed the ISO Register which currently has 6 Linetypes, 23 Hatchstyles, 5 Escapes, and 4 Generalized Drawing Primitives. To date 2 copies of the ISO Register have been distributed.

Software Standards Validation.

Testing programming language compilers for conformance to FIPS and Federal Information Resources Management Regulations (FIRMR) continued to be an important service. In addition to providing test services for COBOL (FIPS 21-2), Fortran (FIPS 69-1), Pascal (FIPS 109), and Ada (FIPS 119), NCSL selected test suites for the programming languages MUMPS (FIPS 125) and C (proposed FIPS) and will establish a validation service for these languages in 1991. The Department of Veterans Affairs and the Defense Medical System Support Center provided funding for the MUMPS research. Validation service is also provided for Database Language SQL (FIPS 127-1).

During FY 1990, validation service was provided to 42 private-sector companies and 1 government agency, resulting in the performance of 184 validations. The laboratory publishes a quarterly Validated Processor List of language processors which have a current certificate; as of September 30, 1990, 487 processors have current validation certificates.

To facilitate the worldwide conformance testing effort, NCSL sponsored an International Workshop on Harmonizing Conformance Testing of Computer Language Standards. Experts from the United Kingdom, France, Italy, Germany, and the United States as well as the Commission of the European Communities (CEC) participated. The attendees researched common areas of agreement among testing laboratories and certification authorities for harmonizing validation testing activities.

SYSTEMS AND SOFTWARE TECHNOLOGY DIVISION

The Systems and Software Technology Division focuses on the development of standards and guidance in software engineering and office systems engineering. The division also consults with federal and industry organizations on technical software problems.

Portable Operating System Interface for Computer Environments (POSIX).

On March 29, 1990, the Secretary of Commerce approved a revision to Federal Information Processing Standard (FIPS) 151, POSIX: Portable Operating System Interface for Computer Environments. Effective September 28, 1990, the revised FIPS 151-1 adopts Institute of Electrical and Electronic Engineers (IEEE) Standard 1003.1-1988 which defines a C language source interface to an operating system environment. FIPS 151-1 permits federal agencies to exercise more effective control over the production, management, and use of information resources by promoting the portability of computer applications at the source code level.

NCSL staff continued to work with voluntary standards committees to develop additional standards needed for interfaces to operating systems. These standards, which include commands and utilities, system administration, and operating system security, address the operating systems functional area of the Applications Portability Profile (APP) that was announced in FIPS 151-1, POSIX.

Applications Portability Profile/ Open System Environments (APP/OSE).

Federal information systems technology is migrating toward open system environments that consist of heterogeneous networked systems, databases, and hardware. An integral part of open systems environments is adherence to consensus-based specifications. Working with users and industry, NCSL continued to develop the required specifications for an Applications Portability Profile (APP), which integrates federal, national, and international standards to provide functionality needed for a broad range of government information technology applications. NCSL hosted two APP/OSE User Forums this year to identify and discuss federal requirements.

A new NCSL publication, NIST Special Publication 500-176, *Introduction to Heterogeneous Computing Environments*, characterizes these environments from the viewpoint of the generic services provided. The report provides an introduction by example to the types of technical standards that are necessary in a heterogeneous computing environment and illustrates how such standards can be used to provide services.

Also developed was a draft "Guide to the Application Portability Profile" to assist federal agencies in making informed choices regarding the selection and use of OSE specifications, and in the development of application profiles based on the APP. The guidance is directed toward managers and project leaders who have the responsibilities of procuring, developing, and maintaining information systems supported by heterogeneous application platforms. NCSL will publish the APP guide as a NIST Special Publication in 1991.

Another component of the APP approved this year for federal agency use was FIPS 158, User Interface Component of the Applications Portability Profile (APP). Effective November 15, 1990, FIPS 158 adopts the X Protocol, Xlib Interface, Xt Intrinsics and Bitmap Distribution Format specifications of the X Window System, Version 11, Release 3 (X Window System is a trademark of MIT). The new standard applies to network-based, bit-mapped graphic systems that are developed or acquired for government use where distributed/networked bit-mapped graphic interfaces to multi-user computer systems are required. FIPS 158 addresses the user interface functional area of the APP that is described in FIPS 151-1, POSIX.

Multi-Media Courseware.

NCSL has been assisting the Department of Defense (DoD) in developing a strategy for multi-media courseware (computer-based interactive training software) to facilitate the creation of an environment in which high-quality portable courseware is available as commercial, off-the-shelf products competitively supplied by vendors. Portable courseware is needed to provide an alternative to the current practice of distributing courseware with proprietary interfaces to system services, and to specify a standard interchange format so that courseware developed on one authoring system may be modified on another.

To this end, NCSL and DoD collaborated in developing a Request for Architecture which would generate a portable courseware system architecture incorporating standards which meet user needs. In April 1990, NCSL solicited proposals for the architecture which addressed a broad set of requirements affecting the creation, distribution, execution, and procurement of courseware. The goal is to develop a computer-based interactive training applications profile, which, along with the system architecture, would provide the basis for identifying needed standards. NCSL plans to accelerate the development of the needed courseware standards through established standards forums.

At a meeting in June, NCSL discussed the architectural proposals for multimedia courseware. The meeting explained NCSL's goals for a family of FIPS for courseware and the process of selecting the architectural proposals. Early next year NCSL will publish a NIST Interagency Report, *Multi-Media Courseware in an Open Systems Environment: A Federal Strategy*, documenting the cooperative efforts of NCSL and DoD in this emerging software area.

Software Quality.

Growing dependence on computers requires assurance that these systems will operate reliably and exactly as intended without adverse effects, even when outside circumstances cause other systems to fail. This year NCSL initiated a new lecture series focusing on problems and potential solutions in building and operating high-integrity systems. Software experts address topics such as management processes (life-cycle methodology, risk management, costing); development processes (formal methods, object-oriented design); and assurance processes (software reliability, cleanroom techniques, formal verification). The goal of the lecture series is to alert federal and industry managers, technical staff, and users of significant issues they must be concerned with in the management of valuable information resources.

In June, NCSL co-sponsored the Fifth Annual Conference on Computer Assurance - COMPASS '90. The conference attracted more than 120 participants from the United States, Canada, Europe, Australia, and Japan. Topics covered included the safety of software-intensive systems, formal methods, security and software system safety standards, regulation of medical software, and liability, certification, and accreditation.

Software acceptance is a life cycle process which includes acceptance of interim and final software products for both new and maintained software systems. NIST Special Publication 500-180, *Guide to Software Acceptance*, assists buyers in understanding acceptance issues relative to a basic life cycle model and some of its variants. The guide also directs managers in planning and implementing a software acceptance program, with emphasis on the final software acceptance testing.

In collaboration with the Information Systems Engineering Division, researchers completed the second year of a joint project in Hypertext. NISTIR 4404, *Dynamic Characteristics of Hypertext*, resulted from that research effort.

Integrated Software Engineering Environments.

The need for high-quality software is closely associated with the need to improve productivity in the development and evolution of that software. NCSL addresses these issues through work on integrated software engineering environments (ISEE). A series of invitational ISEE workshops is being held to develop a reference model and to propose interfaces for fully integrated software engineering environments which will support software products and processes throughout the entire software life cycle. Coupled with the effort to define an ISEE reference model, the workshops are intended to identify fundamental problems and issues in a number of critical ISEE areas. The goal is to define a comprehensive interface for integrating software tools across the software life cycle.

The most recent ISEE workshop was attended by approximately 60 software professionals drawn from government, industry, and academia. The workshop identified coordination needed among other efforts in software engineering environments including the European Computer Manufacturers' Association (ECMA), Defense Advanced Research Projects Agency (DARPA), International Workshop on Computer-Aided Software Engineering (IWCASE) and various DoD, NASA, IEEE, and industry efforts.

In September, NCSL proposed the use of the ECMA reference model for Computer-Assisted Software Engineering Framework as the base definition for the NIST ISEE reference model. This proposal, coupled with an aggressive effort to bring together the many different groups working on some aspect of ISEE, has led to a increasing coalescence of efforts in this area around the NCSL workshops.

COMPUTER SECURITY DIVISION

To carry out the mandate of the Computer Security Act of 1987, the Computer Security Division conducts research and provides guidance and technical assistance to federal agencies and industry in the efficient and cost-effective protection of valuable information resources in computer systems and networks.

Security Planning and Agency Assistance.

The Computer Security Act of 1987 required federal agencies to improve the security and privacy of sensitive information in federal computer systems. In response to the Act and directives from the Office of Management and Budget (OMB), federal agencies prepared and submitted almost 30,000 security plans for unclassified computer systems that contain sensitive information to a joint review team from NCSL and the National Security Agency (NSA). NISTIR 4409, *1989 Computer Security and Privacy Plans (CSPP) Review Project: A First-Year Federal Response to the Computer Security Act of 1987 (Final Report)*, documents the plan review process and recommends actions to improved computer security in federal systems. An October 1990 NCSL Bulletin summarized the report's highlights.

In the next phase of fulfilling the requirements of the legislation, NCSL participated with OMB and NSA in a series of agency assistance visits to provide support to agencies as they implement their computer security plans and programs. The purpose of the visits is to assist agency managers in carrying out their roles and responsibilities in computer security. To provide guidance to agencies on specific yet common problem areas, NCSL collaborated with the federal community to establish two new working groups. One group is drafting standardized specifications and language for federal government computer security services contracts and the second group is developing guidance on computer security in the ADP procurement cycle.

Computer Security Awareness and Training.

The Computer Security Act provides for the mandatory periodic computer security training for all persons involved in the management, use, and acquisition of sensitive federal systems. To assist those responsible for this training, NCSL sponsors and guides a national organization of computer security training professionals. A clearinghouse of security educational materials available to agencies at little or no cost was also established.

Cooperative Interactions.

Established as a government/industry cooperative venture to identify emerging computer security issues, the Computer System Security and Privacy Advisory Board met three times in 1990 and issued letters on the draft European *Information Technology Security Evaluation Criteria* and several other computer security issues. NCSL hosted four meetings of the Federal Computer Security Program Managers Forum this year for the interchange of experience and information on mutual problems and solutions.

In October 1990, NCSL and NSA's National Computer Security Center cosponsored the 13th National Computer Security Conference. Attended by more than 1,700 participants from government, industry, and academia, the conference had as its theme "Information Systems Security: Standards - The Key to the Future."

To provide for the broad dissemination of useful work in computer security by federal agencies and industry, NCSL republished six reports as NIST Interagency Reports (NISTIRs): Department of Energy Risk Assessment Methodology; Department of State Small System Disaster Recovery Plan; Department of Justice Simplified Risk Assessment Guidelines; Federal Aviation Administration AIS Security Accreditation Guidelines; SRI International on Improving the Security of Your Unix System; and the Department of Commerce Methodology for Certifying Sensitive Computer Applications. Also published were NCSL Bulletins on the Data Encryption System, trusted systems technology, computer virus attacks, computer security glossaries, and a summary of the CSPP plan review process. Other computer security documents will appear in the new Special Publication 800 series; NIST Special Publication 800-1, *Computer Security in the 1980s: Selected Bibliography* is the premiere publication in this new series.

NCSL collaborated with industry and the federal community to establish a NIST Computer Emergency Response Team (CERT) system. The NIST CERT serves as a clearinghouse for information exchange when emergency incidents such as computer viruses strike. A second new NCSL initiative is the computer virus research consortium, a government/industry collaborative effort which functions as a development center for new virus technologies and acts as a clearinghouse for information on security products and research. A computer virus resource package was developed and widely disseminated. Additionally the August 1990 NCSL Bulletin focused on computer virus attacks. The computer security electronic bulletin board was expanded to provide more timely and extensive coverage of NCSL's computer security program.

Funded by the Defense Advanced Research Projects Agency (DARPA), researchers developed a personal access prototype system which was implemented in a Smart Token; the next step of implementing the system in a Smart Card is currently underway. Also in process is the revision of Federal Information Processing Standard (FIPS) 140, General Security Requirements for Equipment Using the Data Encryption Standard, which incorporates Federal Standard 1027.

Risk Management. Risk management requires computer system managers to identify risks to their systems and to develop cost-effective means of reducing risks. Risk management implies good security planning based on full awareness of the issues, the constraints, and the resources available.

To assist those responsible for federal risk management, NCSL and NSA's National Computer Security Center (NCSC) co-sponsor the Risk Management Laboratory at NIST's Gaithersburg site. The laboratory serves as an information resource for federal agencies considering the use of automated risk management software packages and advances understanding of risk management. More than 30 risk management packages have been installed in the laboratory and demonstrated to interested federal agencies. NCSL and NCSC co-sponsored the annual international workshop for risk model builders to develop a consensus on a conceptual framework for risk analysis.

Trusted Systems Technology. NCSL began a new initiative for utilizing trusted systems technology, applying the techniques developed for protection of classified systems to sensitive systems. The goal is to extend trusted systems technology beyond military confidentiality to a broader set of security goals, including integrity and availability. The July 1990 NCSL Bulletin provides guidance to federal agencies on the use of trusted systems technology. As a major part of this initiative, NCSL plans to work with European agencies in developing a harmonized international security evaluation criteria and an associated evaluation process.

As part of a growing interest in data integrity as a computer security issue, NCSL co-sponsored the third in a series of workshops on the subject. Based on the workshop efforts, NCSL is seeking consensus on a draft integrity guideline to be published for use by the federal community and industry.

Network Security. Working in partnership with industry and drawing upon NSA's technology, NCSL's OSI Security Laboratory continued to develop the Secure Data Network System (SDNS) for unclassified but sensitive distributed data network applications. IBM, DEC, Hughes Aircraft Company, and Sun Microsystems loaned equipment to the laboratory and developed SP4, an OSI security protocol for use at the transport layer of the OSI reference model. Four NIST Interagency Reports (NISTIRs) document this work.

New initiatives in OSI data labeling and key management are providing the required supporting security services to make secure open distributed systems a reality. An invitational workshop on Labels for Open Systems attracted an international audience receptive to new network data labeling proposals.

NCSL assisted the Internal Revenue Service (IRS) in the development of a network security architecture in preparation for their 1998 new IRS network system. An ISDN Security Framework was also developed for NSA. Participation in national and international standards committees continued, particularly the newly formed JTC1 SC27 committee on Security Application Techniques.

SYSTEMS AND NETWORK ARCHITECTURE DIVISION

The Systems and Network Architecture Division advances the development and implementation of Open Systems Interconnection (OSI) technology. OSI describes an architecture for computer networks and a family of standards that allow different computer systems to interoperate through data communications networks.

GOSIP. On August 15, 1990, the Government Open Systems Interconnection Profile (GOSIP) became mandatory for use in federal procurements. Approved in 1988 as Federal Information Processing Standard (FIPS) 146, GOSIP is based on NIST Workshop for Implementors of OSI (NIST/OSI Workshop) agreements and specifies certain parameters and options that allow systems acquired by the federal government to interoperate in a multi-vendor environment.

GOSIP, Version 1, includes the Message Handling System (MHS) and File Transfer, Access, and Management (FTAM) applications. MHS allows a user to send or receive electronic mail; FTAM permits a user to transfer or receive a file from a remote host. Implementations of these applications that conform to the international standards can differ greatly in the services they provide to the user. Some services are optional and may or may not be included in a conforming implementation. Other services, such as those related to the creating and editing of an electronic mail message, are local issues and not subject to standardization. Implementations can also differ in architecture and performance.

NIST Special Publication 500-182, *Guidelines for the Evaluation of Message Handling Systems Implementations*, assists federal agencies in determining which implementation, among several candidates, best meets the functional and performance requirements of the user. Users will make this decision by filling in a matrix which matches their requirements with the services provided by existing implementations. An algorithm to assist in the rating process is provided. Work is underway to develop guidelines for evaluating FTAM implementations.

GOSIP, Version 2, which adds the Virtual Terminal application and allows the MHS and FTAM applications to transfer documents constructed according to the Office Document Architecture (ODA) format, was proposed in July 1989 and is expected to be approved by the Secretary of Commerce as a FIPS in 1991. Future versions of GOSIP will incorporate additional applications.

NIST/OSI Workshop. The NIST/OSI Workshop met four times in 1990. Established by NCSL in 1983, the workshop is an open international forum with participation of more than 200 computer manufacturers, semiconductor manufacturers, word processing vendors, process control vendors, communication carriers, and industry and government users from the United States, Canada, Europe, Australia, and other countries. The workshop accomplishes its objectives through special interest groups (SIGs) which focus on the lower and upper OSI layers, electronic mail, file transfer, Virtual Terminal, security, Office Document Architecture, directory services, and network management.

The output of this workshop is a documented set of agreements that facilitate the implementation of interoperable OSI products. NISTIR 4382, *Working Implementation Agreements for Open Systems Interconnection Protocols*, documents preliminary agreements which serve as a basis for additional work. Final agreements have been published in NIST Special Publication 500-177, *Stable Implementation Agreements for Open Systems Interconnection Protocols - Version 3, Edition 1.*

Conformance Testing.

Testing of OSI products for conformance to standards is valuable for both users and vendors in achieving interoperability of different vendors' systems, and in setting the foundation for testing for quality, functionality, and performance of systems.

NCSL developed a policy for testing implementations of GOSIP, Version 1, to support the interoperability of hardware, software, and telecommunications systems. The laboratory is developing procedures and criteria for testing for GOSIP protocols, for registration of conformant products, recognized tests, and suitable testers, and for accreditation of testing laboratories. These procedures will be put into operation during 1991.

Open Systems Interconnection Network (OSINET).

To advance the development and use of commercial OSI products, NCSL organized OSINET, a cooperative government/industry research network. OSINET currently has about 45 participants including vendors, federal agencies, and commercial organizations. Tests of vendor interoperability conducted on OSINET assist government and industry in monitoring the progress of OSI products and in evaluating products to meet their needs.

Interoperability tests have been developed by the OSINET Technical Committee for the MHS and FTAM applications. The development of these test suites has been coordinated internationally through OSINET's participation in OSIone, an association of regional OSI networks. Developers of OSI profiles such as the federal government can specify the set of tests that must be successfully completed to meet their requirements in an appendix to the test suite documents. NISTIR 4435, *FTAM Interoperability Test*, and NISTIR 4452, *Message Handling Systems Interoperability Tests*, describe the interoperability test suites for those applications.

Integrated, Interoperable Network Management.

As the success of OSI creates large, multi-vendor networks composed of many components, the management of network functions and the protection of information transmitted through networks becomes more challenging. Proprietary systems provide for these functions but multi-vendor open systems have different requirements. NIST Special Publication 500-175, *Management of Networks Based on Open Systems Interconnection (OSI) Standards: Functional Requirements and Analysis*, examines current and proposed network management systems to determine both user and functional requirements for network management. The examination of requirements focuses on those necessary for interoperability in the following broad areas: architecture, configuration management, fault management, security management, performance management, and accounting management.

To assist federal agencies in implementing FIPS 146, GOSIP, NCSL and the General Services Administration (GSA) are collaborating in the pilot deployment in 1991 of X.500 on FTS2000, the governmentwide telecommunications network. The pilot project transfers a key technology, the OSI Directory, to government agencies to support naming, locating, and addressing resources and provides experience in large-scale deployments of X.500 to the federal community.

To meet the need for interoperable network management products within the government, NCSL is developing a FIPS for Network Management to be called the Government Network Management Profile (GNMP). Phase 1 GNMP, to be proposed in January 1991, will consist of specifications pertaining to management communications, management information, and systems management functions. Each subsequent phase will add to the management capabilities and managed objects proposed in Phase 1 GNMP.

NCSL consulted with the Federal IRM Policy Council (FIRMPoC), an interagency group sponsored by the Office of Management and Budget, to provide FIRMPoC members with electronic mail (E-mail) connectivity based on the CCITT X.400 series of recommendations. An NCSL staffer chaired an interagency working group to develop the procedure for interconnecting council members through a standards-based E-mail facility on the FTS-2000 network.

National and International Collaboration.

NCSL continued to collaborate with national and international standards organizations, with participants in the NIST/OSI Workshop, and with other industry and user organizations. Through technology transfer and active involvement with voluntary industry groups, NCSL continued to support the development of standards and technology needed for the interoperability and security of tomorrow's high-speed, high-performance networks.

On October 2-3, 1990, NCSL co-sponsored the 6th International Conference on the Application of Standards for Open Systems. More than 150 computer professionals from government, industry, and user organizations worldwide attended the event. Challenging the international community to work together to develop policies, standards, and conformance tests that will advance the development and use of open systems, the conference program featured 36 experts representing governments throughout the world. Key issues addressed included policy development, international collaboration, free trade and standards, OSI applications, conformance and interoperability, and security.

ADVANCED SYSTEMS DIVISION

The Advanced Systems Division conducts research and provides technical assistance to federal agencies and industry in Integrated Services Digital Network (ISDN), parallel processing performance, data storage, distributed systems, image recognition, and speech recognition.

ISDN. To accelerate the specification of a standard conformant ISDN in the United States and to create a strong user voice in the implementation of ISDN applications, NCSL continued to sponsor the North American ISDN Users' Forum (NIU-Forum). The NIU-Forum met three times in 1990 with about 300 vendor and user participants. The forum published its first volume of Working Agreements in June, including implementation agreements for call signalling, abstract conformance test suites, specification for application software interface, and application profiles for incoming call management, building controls, telephone/workstation integration, and data conferencing.

In 1990, NCSL staff, working through the NIU-Forum, actively participated in development efforts of national and international standards organizations. Attention was focused on the high-speed areas: Technical Committee T1S1 Broadband ISDN; Institute of Electrical and Electronic Engineers (IEEE) Standards Committee 802.9 Integrated Voice and Data Local Area Network (LAN); and Technical Committee X3T9 Fiber Distributed Data Interface (FDDI) LAN. The forum also developed a conformance tester generation facility to help the industry in implementing their abstract test suites.

Parallel Processing Performance. Partially funded by the Defense Advanced Research Projects Agency (DARPA), researchers continued to seek an integrated approach to the measurement and characterization of computer performance, including test and benchmark software and small, low-cost measurement hardware. Major accomplishments included the successful production of Very Large Scale Integration (VLSI) versions of the time-trace-system (uTRAMS) and resource measurement system (uREMS) designs. The design and submission for fabrication of multilayer circuit boards to install the uTRAMS and uREMS VLSI chips in a distributed memory multicomputer was subsequently completed. Researchers also refined the methodology of concisely expressing and predicting performance based on measured or estimated requirements of applications and the performance strengths of computers, further demonstrating this approach on instrumented computers.

Data Storage. Under an interagency agreement with the National Archives and Records Administration (NARA), NCSL initiated a study of the care and handling of optical disk media. A test methodology was developed to predict the life expectancy of optical disk media. Researchers have also begun work on the development of an industry consensus concerning on-line methods for monitoring and reporting optical disk error rates.

Work continued on a project with the National Aeronautics and Space Administration (NASA) to provide the leadership and organization for a NIST/NASA/industry working group to document the testing methodology and specifications for 14-inch ruggedized erasable optical disk media/drive. The working group produced a draft document on test methods.

NCSL continued to assist the Social Security Administration (SSA) in evaluating optical disk storage for their files. Work was completed on a prototype system demonstrating the use of optical disk technology to image, store, and retrieve information from SSA folders. Current research focuses on the development of a pilot system to test the use of optical disk storage for SSA earnings records.

With support from SSA and NARA, NCSL continued an active leadership role in Technical Committee X3B11 on optical disk, including chairing the working group on test methods. The laboratory is also involved, with support from industry, in the work of Technical Committee X3B5, Digital Magnetic Tape. The development and production of Standard Reference Materials (SRMs) specified in national and international digital magnetic tape interchange standards continued.

Distributed Systems. In support of research and standards development for distributed computer systems, NCSL participated in the development of a voluntary industry standard for Distributed Transaction Processing, including a formal description of the protocol in Estelle, a simulation model, and a prototype implementation. Distributed applications using the protocol for accessing distributed multimedia information were developed and demonstrated.

Research in distributed systems architectures resulted in the development of a unifying architecture called the Services Backplane which provides a common interface between applications and services. Work continued on a generalized information system including mixed media information (e.g., graphics, images, and text) via a Virtual Workstation Architecture. Researchers also participated in the definition and specification of the Application Software Interface being developed in the NIU-Forum.

Image Recognition. Two NCSL researchers received the prestigious R&D 100 Award from *Research & Development* magazine for developing a computer system which automatically retrieves relevant text from large databases in response to simple natural language user queries. The information retrieval system accepts a simple user query such as a sentence or a phrase and returns a list of records ranked in order of likely relevance to that query within one or two seconds. The computer system is particularly well suited for retrieval from manuals, sets of related records, bibliographic files, and other types of data containing sufficient amounts of text.

NCSL continued to support the Federal Bureau of Investigation in developing standards for automated fingerprint identification systems. One standard under development is an image data exchange standard to allow transfer of fingerprint images between law enforcement organizations using systems manufactured by different vendors. NCSL sponsored a Fingerprint Imaging Workshop in September.

Research in the application of image recognition technology to the processing of government forms in support of the Bureau of the Census and the Internal Revenue Service was expanded. In support of evaluation standards for hand-printed optical character recognition, a database of images of isolated and grouped hand-printed digits, hand-printed alphabets, and hand-printed text was developed. The data provides a test sample from 2,100 individuals and contains over 1 million hand-printed characters. As of October 1990, 23 copies of the database had been distributed.

Speech Recognition. Sponsored in part by DARPA's Information Science and Technology Office, research in speech recognition technology proceeded in cooperation with academia and industry. NCSL continued to use CD-ROM data storage media in the United States for the exchange of recorded speech databases ("corpora") within the speech research community. Three CD-ROM sets were prepared and released for DARPA, complementing earlier releases in this series. Additional releases will be produced as reference material for use in speech research.

NCSL's research involved the design and development of test procedures and other materials for the DARPA Spoken Language Systems Program and other DoD speech research programs. Researchers have designed and periodically administered DARPA benchmark tests for large vocabulary speech recognition systems since 1987, most recently in June 1990; these tests involve DARPA and AT&T Bell Laboratories. This year the scope of these tests was enlarged to include complete spoken language systems. Seven systems were tested in June 1990, six natural language systems and one complete spoken language system from Carnegie Mellon University.

TECHNOLOGY TRANSFER

PARTICIPATION IN VOLUNTARY STANDARDS ACTIVITIES

NCSL staff members participate in more than 85 national and international voluntary standards activities, including the following:

American National Standards Institute (ANSI):
- Information Systems Standards Board (ISSB)
- Information Technology Consultative Committee (ITCC)

Accredited Standards Committee (ASC):
- T1, Telecommunications
- X3, Information Processing Systems
- X9, Financial Services
- X12, Electronic Data Interchange (EDI)
- IT9, Physical Properties and Permanence of Imaging Media

Institute of Electrical and Electronic Engineers (IEEE):
- IEEE Standards Board and Committees

IEEE Groups for:
- Local Area Networks
- Portable Operating System Interface (POSIX)
- Graphical User Interface
- Software Engineering
- U.S. TAG for JTC1 SC 7
- Futurebus

International Organization for Standardization (ISO)/
International Electrotechnical Commission (IEC)
Joint Technical Committee 1 (JTC1) on Information Technology

U.S. Technical Advisory Group (TAG) for ISO/IEC JTC1 (JTC1 TAG)

International Telegraph and Telephone Consultative Committee (CCITT)
Study Groups for:
- Data Communications Networks
- Switching and Signaling

U.S. National Committee for CCITT:
- Study Group B
- Study Group D

International Organization for Standardization (ISO)
- Technical Committees for:
- Industrial Automation
- Micrographics and Optical Memories for Document and Image Recording, Storage and Use

ASC X3 Subgroups for:

BASIC
Computer Graphics
Credit/Identification Cards
Database
Data Communications
Data Interchange
Data Representation
Digital Magnetic Tape
I/O Interface
Information Resource Dictionary System
Information Technology Security Techniques
LISP
Open Distributed Processing
Open Systems Interconnection
Optical Digital Data Disks
Parallel Processing Constructs for High-Level Programming Languages
Picture Coding
Secretariat Management Committee (SMC)
Standards Planning and Requirements Committee (SPARC)
SPARC Database Systems Study Group
SPARC Security Study Group
Strategic Planning Committee (SPC)
Text: Office and Publishing Systems
U.S. TAG for JTC1 SC 21
U.S. TAG for JTC1 SC 22

ASC T1 Technical Subcommittee for:

Services, Architecture and Signaling

JTC1 TAG Subgroups for:

Advisory Committee
Application Portability
EDI
Functional Standards
Procedures
Registration Authorities

ISO/IEC JTC1 Subcommittees or Groups for:

Advisory Group
Applications Portability
Computer Graphics
Design and Documentation of Computer-Based Information Systems
Flexible Magnetic Media for Digital Data Interchange
Functional Standardization
Information Retrieval, Transfer and Management for OSI
Information Technology Security Techniques

Interconnection of Information Technology Equipment
Languages
Optical Disk Cartridges for Information Interchange
Procedures
Registration Authorities
Representation of Data Elements
Strategic Planning
Telecommunications and Information Exchange Between Systems
Text and Office Systems

European Computer Manufacturers Association (ECMA) Technical Committees or Task Groups for:

Lower Four OSI Layers and Local Area Networks
Magnetic Tapes

Association for Information and Image Management (AIIM)

Canadian Committee on Geomatics

Data Administration Management Association Standards and Procedures Subgroup

Federal Interagency Coordinating Committee on Digital Cartography

Federal Telecommunication Standards Committee

Fiber Optics Coordinating Committee

Information Technology Requirements Council

International Association for Identification

National Association of State Resource Executives

NIST Workshop for Implementors of OSI

North American ISDN Users' Forum

U.S. Board on Geographic Names

NCSL staff members hold key leadership positions in many of the above activities.

COLLABORATION WITH GOVERNMENT, INDUSTRY, AND ACADEMIA

In 1990, NCSL collaborated with the following agencies in government, industry, and academia, some of which supported NCSL research through funding or the loan of equipment or software.

Federal Agencies

Department of Defense
- Air Force Wright Research and Development Center
- Chief of Naval Personnel
- Computer-aided Acquisition and Logistics Support (CALS)
- Corporate Information Management Office
- Defense Advanced Research Projects Agency
- Defense Logistics Agency
- Defense Medical Agency
- Defense Medical System Support Center
- National Security Agency
- Navy Fleet Combat Directions System Support Activity
- Office of the Secretary of Defense

Department of Commerce
Department of Energy
Department of Justice
Department of State
Department of the Treasury Financial Management Service
Department of Veterans Affairs
Federal Aviation Administration
Federal Bureau of Investigation
Internal Revenue Service
National Archives and Records Administration
National Aeronautics and Space Administration
Social Security Administration

Industry

AT&T Bell Laboratories
Digital Equipment Corporation
Hughes Aircraft Company
International Business Machines
Sun Microsystems

Academia

Carnegie Mellon University

GUEST RESEARCHERS FY 1990

Guest Scientists and Research Associates **26**

Organizations represented included:

China State Bureau of Standards
Dale, Gesek, McWilliams, & Sheridan Inc.
Digital Equipment Corporation
East China Normal University
Environmental Protection Agency
Institute of Geology, Beijing, China
Institut National Des Telecommunications, France
Internal Revenue Service
International Business Machines
International Computer, England
National Science Foundation
Northeast University of Technology
Rafael, Haifa, Israel
Space Science & Tech Center, Chinese Academy of Science
Standards Promotion and Application Group, s.a.
Sun Microsystems
Swedish Telecom & Scholarship
Tsinghua University of China
University of Bordeaux, France
University of Twente

Faculty Appointments **6**

University of Maryland, College Park, MD
University of Maryland, Baltimore, MD
University of Pittsburgh

PUBLICATIONS

NIST COMPUTER SYSTEMS TECHNOLOGY SERIES FY 1988 - FY 1990

NIST SPEC. PUB. TITLE

500-149 *Guide on Data Entity Naming Conventions*
By Judith Newton
SN 003-003-02818-5 $3.00 Oct 1987

500-150 *Stable Implementation Agreements for Open Systems Interconnection Protocols Version Edition 1*
Workshop Chairman, Robert Rosenthal
PB 88-168331 $24.95 Dec 1987

500-151 *A Knowledge-Based System for Physical Database Design*
By Christopher E. Dabrowski and David K. Jefferson
SN 003-003-02849-5 $3.25 Apr 1988

500-152 *Guide to Information Resource Dictionary Applications:*
General Concepts and Strategic Systems Planning
By Margaret H. Law
SN 003-003-02865-7 $8.00 Apr 1988

500-153 *Guide to Auditing for Controls and Security: A System Development Life Cycle Approach*
Editor/Authors Zella G. Ruthberg, Bonnie Fisher-Wright, William E. Perry, John Lainhart, James G. Cox, Mark Gillen, and Douglas Hunt
SN 003-003-02856-8 $13.00 Apr 1988

500-154 *Guide to Distributed Database Management*
By Elizabeth N. Fong and Bruce Rosen
SN 003-003-02848-7 $1.75 Apr 1988

500-155 *Management Guide to Software Reuse*
By William Wong
SN 003-003-02858-4 $2.00 Apr 1988

500-156 *Message Authentication Code (MAC) Validation System: Requirements and Procedures*
By Miles Smid, Elaine Barker, David Balenson, and Martha Haykin
SN 003-003-02860-6 $2.75 May 1988

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST SPEC. PUB. TITLE

500-157 *Smart Card Technology: New Methods for Computer Access Control*
By Martha E. Haykin and Robert B. J. Warnar
SN 003-003-02887-8 $2.75 Sept 1988

500-158 *Accuracy, Integrity, and Security in Computerized Vote-Tallying*
By Roy G. Saltman
SN 003-003-02883-5 $7.50 Aug 1988

500-159 *Data Administration: Management and Practice - Proceedings of the First DAMA Symposium*
Judith J. Newton and Frankie E. Spielman, Editors
SN 003-003-02901-7 $7.00 Oct 1988

500-160 *Report of the Invitational Workshop on Integrity Policy in Computer Information Systems (WIPCIS)*
Stuart W. Katzke and Zella R. Ruthberg, Editors
SN 003-003-02904-1 $11.00 Jan 1989

500-161 *Software Configuration Management: An Overview*
By Wilma Osborne
SN 003-003-02927-1 $2.00 Mar 1989

500-162 *Stable Implementation Agreements for Open Systems Interconnection Protocols - Version 2, Edition 1*
Tim Boland, Workshop Chairman
SN 003-003-02921-1 $26.00 Dec 1988

500-163 *Government Open Systems Interconnection Users' Guide*
By Tim Boland
PB 90-111212 $23.00 Aug 1989

500-164 *Electronic Publishing: Guide to Selection*
By Lynne Rosenthal
SN 003-003-02938-6 $2.50 Jun 1989

500-165 *Software Verification and Validation: Its Role in Computer Assurance and Its Relationship with Software Product Management Standards*
By Dolores Wallace and Roger Fujii
SN 003-003-02959-9 $2.25 Sep 1989

500-166 *Computer Viruses and Related Threats: A Management Guide*
By John P. Wack and Lisa J. Carnahan
SN 003-003-02955-6 $2.50 Aug 1989

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST SPEC. PUB. TITLE

500-167 *Information Management Directions: The Integration Challenge*
By Elizabeth N. Fong and Alan H. Goldfine
SN 003-003-02973-4 $9.00 Sep 1989

500-168 *Report of the Invitational Workshop on Data Integrity*
By Zella G. Ruthberg and William T. Polk
SN 003-003-02966-1 $20.00 Sep 1989

500-169 *Executive Guide to the Protection of Information Resources*
By Cheryl Helsing, Marianne Swanson, and Mary Anne Todd
SN 003-003-02969-6 $1.50 Oct 1989

500-170 *Management Guide to the Protection of Information Resources*
By Cheryl Helsing, Marianne Swanson, and Mary Anne Todd
SN 003-003-02968-8 $1.75 Oct 1989

500-171 *Computer Users' Guide to the Protection of Information Resources*
By Cheryl Helsing, Marianne Swanson, and Mary Anne Todd
SN 003-003-02970-0 $1.00 Oct 1989

500-172 *Computer Security Training Guidelines*
By Mary Anne Todd and Constance Guitian
SN 003-003-02975-1 $2.50 Nov 1989

500-173 *Guide to Data Administration*
By Bruce K. Rosen and Margaret H. Law
SN 003-003-02967-0 $4.25 Oct 1989

500-174 *Guide for Selecting Automated Risk Analysis Tools*
By Irene E. Gilbert
SN 003-003-02971-8 $2.00 Oct 1989

500-175 *Management of Networks Based on Open Systems Interconnection (OSI) Standards: Functional Requirements and Analysis*
By Robert Aronoff, Michael Chernick, Karen Hsing, Kevin Mills, and Daniel Stokesberry
SN 003-003-02986-6 $7.00 Nov 1989

500-176 *Introduction to Heterogeneous Computing Environments*
By John Barkley and Karen Olsen
PB 90-154774 $11.00 Nov 1989

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

NIST SPEC. PUB. TITLE

500-177 *Stable Implementation Agreements for Open Systems Interconnection Protocols, Version 3, Edition 1, Dec 1989*
Tim Boland, Workshop Chairman
SN 003-003-02995-5 $31.00 Dec 1989

500-178 *Proceedings of the Hypertext Standardization Workshop, January 16-18, 1990*
By J. Moline, D. Benigni, and J. Baronas
SN 003-003-02998-0 $14.00 Mar 1990

500-179 *Object Database Management Systems: Concepts and Features*
By C. Dabrowski, E. Fong, and D. Yang
SN 003-003-03007-4 $3.75 Apr 1990

500-180 *Guide to Software Acceptance*
By Dolores Wallace and J. Cherniavsky
SN 003-003-03008-2 $2.50 Apr 1990

500-181 *PHIGS Validation Tests (Version 1.0): Design Issues*
By John Cugini, Mary T. Gunn, and Lynne S. Rosenthal
SN 003-003-03028-7 $1.75 Jul 1990

500-182 *Guidelines for the Evaluation of Message Handling Systems Implementation*
By Steve Trus, Curtis Royster, and Paul Markovitz
PB 90-269598 $23.00 Aug 1990

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

COMPUTER SECURITY SERIES FY 1990

NIST SPEC. PUB. TITLE

800-1 *Computer Security in the 1980s: Selected Bibliography*
Rein Turn, Compiler, and Lawrence E. Bassham, Editor
SN 003-003-03060-1 $11.00 Dec 1990

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

OTHER NIST PUBLICATIONS FY 1989 - FY 1990

PUB. NUMBER TITLE

NISTIR 88-3896 *Proceedings of the Federal Information Processing Standards Workshop on Information Resource Dictionary System (IRDS) Applications*
Alan Goldfine, Editor
December 1988 PB 89-136329 $21.95

NISTIR 88-4001 *Wavefront Matrix Multiplication on a Distributed-Memory Multiprocessor*
James Nechvatal, Editor
January 1989 PB 89-151807 $15.95

NISTIR 88-4017 *Standards for the Interchange of Large Format Tiled Raster Documents*
By Frankie Spielman
December 1988 PB 89-148415 $15.95

NISTIR 88-4022 *Issues in Interpreting The Export Administration Regulations, "Processing Data Rate"*
By Vivian Lawrence
February 1989
Available from Advanced Systems Division

NISTIR 89-4023 *Small Computer System Interface (SCSI) Command System: Software Support for Control of Small Computer System Interface Devices*
By John Gorczyca and Eduardo Villagran
January 1989 PB 89-151815 $21.95

NISTIR 89-4053 *Architecturally-Focused Benchmarks with a Communication Example*
By G.E. Lyon, R. D. Snelick
March 1989 PB 89-216477 $13.95

NISTIR 89-4063 *Hybrid Structures for Simple Computer Performance Estimates*
By Gordon Lyon
March 1989 PB 89-189161 $13.95

NISTIR 89-4128 *Processing Rate Sensitivities of a Heterogeneous Multiprocessor*
By G.E. Lyon
August 1989 PB 89-229017 $13.95

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 89-4139 *A Detailed Description of the Knowledge-Based System for Physical Database Design (2 volumes)*
By Christopher E. Dabrowski
August 1989 PB 89-228993 (vol. 1) $17.00
PB 89-229003 (vol. 2) $23.00

NISTIR 89-4140 *Working Implementation Agreements for Open System Interconnection Protocols*
Tim Boland, Editor
September 1989 PB 89-235931 $36.95

NISTIR 89-4158 *OSINET General Agreements and Information Document*
By Gerard F. Mulvenna
August 1989
Restricted to NIST use only

NISTIR 89-4160 *Trial of Open System Interconnection (OSI) Protocols Over Integrated Services Digital Network (ISDN)*
By Carol A. Edgar
August 1989 PB 89-235576 $13.95

NISTIR 89-4169 *Use of the IRDS Standard in CALS*
By David K. Jefferson and Cita M. Furlani
September 1989 PB 90-112467 $15.00

NISTIR 89-4198 *Working Implementation Agreements for Open Systems Interconnection Protocols*
Tim Boland, Editor
December 1989 PB 90-146440 $44.00

NISTIR 89-4199 *Graphics Application Programmer's Interface Standards and CALS*
By Sharon Kemmerer and Mark Skall
October 1989 PB 90-133091 $15.00

NISTIR 90-4228 *Prototyping SP4 A Secure Data Network System Transport Protocol Interoperability Demonstration Project*
By C. Dinkel, N. Nazario, and R. Rosenthal
January 1990 PB 90-159609 $15.00

NISTIR 90-4240 *Architectures for Future Multigigabit Lightwave Networks*
By W. Burr
February 1990 PB 90-198953 $17.00

NISTIR 90-4247 *Working Implementation Agreements for Open Systems Interconnection Protocols*
Tim Boland, Editor
March 1990 PB 90-197948 $30.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE
NISTIR 90-4250	*Secure Data Network System (SDNS) Network, Transport, and Message Security Protocols* By C. Dinkel February 1990 PB 90-198946 $17.00
NISTIR 90-4259	*Secure Data Network System (SDNS) Access Control Documents* By C. Dinkel February 1990 PB 90-188061 $23.00
NISTIR 90-4262	*Secure Data Network System (SDNS) Key Management Documents* By C. Dinkel February 1990 PB 90-188079 $17.00
NISTIR 90-4267	*A Conformance Test for FDDI Medium Access Control (MAC)* By Z. Liu and W. Burr July 1990 PB 90-265323 $23.00
NISTIR 90-4275	*Workloads, Observables, Benchmarks and Instrumentation* By G. Lyon and R. Snelick April 1990 PB 90-207770 $15.00
NISTIR 90-4292	*Data Administration: Standards and Techniques, Proceedings of the Second Annual DAMA Symposium* By J. Newton and F. Spielman April 1990 PB 90-204512 $23.00
NISTIR 4325	*U.S. Department of Energy Risk Assessment Methodology* E. Roback, NIST Coordinator May 1990 PB 90-244484 $23.00
NISTIR 4329	*Graphics Standards in the Computer-Aided Acquisition and Logistic Support (CALS) Program, FY 1989, Volume 1: Test Requirements Document, Extended CGM (CGEM)* D. Benigni, Editor July 1990 PB 90-257759 $38.00
NISTIR 4330	*Graphics Standards in the Computer-Aided Acquisition and Logistic Support (CALS) Program, FY 1989, Volume 2: MIL-D-28003 Revisions, CGM Registration* D. Benigni, Editor May 1990 PB 90-228016 $38.00
NISTIR 4331	*Emulation Through Time Dilation* By J. Antonishek and R. Snelick May 1990 PB 90-228024 $15.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 4349 *User's Guide for the PHIGS Validation Tests (Version 1.0)*
By J. Cugini, M. Gunn, and L. Rosenthal
August 1990 PB 90-265216 $23.00

NISTIR 4359 *Domestic Disaster Recovery Plan for PCs, OIS, and Small VS Systems*
E. Roback, NIST Coordinator
August 1990 PB 90-265240 $15.00

NISTIR 4362 *Security Labels for Open Systems An Invitational Workshop*
By N. Nazario
June 1990 PB 90-247446 $30.00

NISTIR 4374 *The Naming Forum: Proceedings of the IRDS Workshop on Data Entity Naming Conventions*
By J. Newton
July 1990 PB 90-250119 $23.00

NISTIR 4377 *A Framework for Developing a CALS Data Dictionary*
By D. Jefferson
July 1990 PB 90-257585 $15.00

NISTIR 4378 *Automated Information System Security Accreditation Guidelines*
E. Roback, NIST Coordinator
August 1990 PB 90-264102 $15.00

NISTIR 4382 *Working Implementation Agreements for Open Systems Interconnection Protocols*
Tim Boland, Editor
September 1990 PB 90-259763 $44.00

NISTIR 4384 *Design Issues for Conformance Testing of the PHIGS Standard*
By J. Cugini and L. Rosenthal
August 1990 PB 90-264094 $15.00

NISTIR 4387 *U.S. Department of Justice Simplified Risk Analysis Guidelines (SRAG)*
E. Roback, NIST Coordinator
August 1990 PB 90-265257 $17.00

NISTIR 4404 *Dynamic Characteristics of Hypertext*
By R. Furuta and P. David Stotts
August 1990 PB 91-107276 $15.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PUB. NUMBER	TITLE

NISTIR 4409 *1989 Computer Security and Privacy Plans (CSPP) Review Project: A First-Year Federal Response to the Computer Security Act of 1987 (Final Report)*
Dennis M. Gilbert, Report Coordinator
September 1990 PB 91-107504 $23.00

NISTIR 4418 *State Occupancy Information for Performance Comparisons*
By Gordon Lyon
October 1990 PB 91-112879 $15.00

NISTIR 4432 *Status of PDES-Related Activities (Standards & Testing)*
By Cita Furlani, Joan Wellington, and Sharon Kemmerer
October 1990 PB 91-112888 $15.00

NISTIR 4435 *FTAM Interoperability Test*
By Carol Edgar
August 1990 PB 91-107565 $23.00

NISTIR 4451 *U.S. Department of Commerce Methodology for Certifying Sensitive Computer Applications*
Edward Roback, NIST Coordinator
November 1990 PB 91-120162 $17.00

NISTIR 4452 *Message Handling Systems Interoperability Tests*
By Carol Edgar
October 1990 PB 91-112789 $17.00

NISTIR 4453 *SRI International Improving the Security of Your UNIX System*
Edward Roback, NIST Coordinator
November 1990 PB 91-120121 $17.00

SN numbers - stocked by GPO
PB numbers - stocked by NTIS

PAPERS

SEPTEMBER 1989 THROUGH OCTOBER 1990

Mink, Alan; Carpenter, Robert; **A VLSI Chip for a Multiprocessor Performance Measurement System.** Proceedings, September 15, 1989.

Furuta, Richard; **Important Papers in the History of Document Preparation Systems.** Electronic Publishing, September, 1989.

Garofolo, John S.; Pallett, David S.; **Use of CD-ROM for Speech Database Storage and Exchange.** Proceedings, September 22, 1989.

Kuhn, David R.; **Generating Extended State Transitions from Structured Specifications for Process Control Systems.** IEEE/BCS Software Engineering Journal, September 1989.

Harman, Donna; Candela, Gerald; **A Very Fast Prototype Retrieval System Using Statistical Ranking.** SIGIR Forum, September 1989.

Podio, Fernando L.; Onyshczak, Remigius; Villagran, Eduardo Sanchez; **Development of a Testing Methodology to Predict the Life Expectancy of Optical Disk Media.** Progress Report to National Archives and Records Administration, October 1989.

Favreau, Jean-Philippe; Linn, Richard J.; Nightingale, Stephen A.; **Formal Multi-Layer Test Methodology and Its Application to OSI.** Proceedings of 2nd International Conference of FORTE '89, On Formal Description Techniques for Distributed Systems and Communications Protocols, December 5-8, 1989.

Burrows, James H.; Radack, Shirley M.; **Conformance and Test Policies, 5th International Conference on Applications of Standards for Open Systems Interconnection.** Tokyo, Japan, December 21, 1989.

Steinauer, Dennis; **Latest Research on Minimizing Security Risks for PCs and LANS.** 10th Annual Conference on Control, Audit and Security of Information Systems, October 1990.

Harmon, Donna K.; Candela, Gerald T.; **Bringing Natural Language Information Retrieval Out of the Closet.** Published in SIGCHI Bulletin, January 1990.

Podio, Fernando L.; **Standardization of Testing Methods for Optical Media Characteristics and Related Activities at the National Institute of Standards and Technology.** Optical Information Systems, January 16, 1990.

Jefferson, David K.; **Data Management Standards in Computer-Aided Acquisition and Logistic Support (CALS).** Proceedings of the Technology for Space Station Evolution Workshop, Dallas, Texas, January 16-18, 1990.

Baronas, Jean; **Guideline for Quality Control of Image Scanners.** Datamation, January 19, 1990.

Saltman, Roy G.; **Accuracy and Integrity of Computerized Vote-Counting: Answers to Fundamental Questions for Election Administrators.** Published by Election Center, January 25, 1990.

Moline, Judi; **Linking Information to Objects: A Hypertext Prototype for Numismatists.** Visual Resources Journal, January 1990.

Lennon, Elizabeth B.; **Information Systems Security: Solutions For Today, Concepts For Tomorrow.** NIST Journal of Research, January/February 1990.

Hankinson, Allen L.; **Open System Standards: A Federal Strategy.** UNIX, January 1990.

Wong, William; Zelkowitz, Marvin; **A Preliminary Description of an Integrated Software Engineering Environment (ISEE) Reference Model.** February 1990.

Law, Margaret H.; **The Role of Data Management in Software Engineering.** Proceedings of National Conference on Software Development, February 1990.

Tom, Henry; **Geographic Information Systems (GIS) Standards: A Federal Perspective.** GIS World, February 1990.

Wakid, Shukri; Roberts, Kathleen; **Application Profile Proforma for ISDN.** IEEE, March 1990.

Su, David; Collica, Leslie; **ISDN Conformance Testing.** IEEE, March 1990.

Dawson, Frank; Nielsen, Fran; **Opening Your Office with ODA.** Unix Review, March 1990.

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Qian, Xiaomei; Wakid, Shukri; Vaman, Dhadesugoor; Cypher, David; **Architectures for B-ISDN Networks: A Performance Study.** International Journal of Analog and Digital Cable Systems, March 1990.

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Gallager, Leonard J.; Furuta, Richard; Stotts, David P.; **Increasing the Power of Hypertext Search with Relational Queries.** Taylor Graham Publishing, London, UK. Spring 1990.

Svetliza, Javier; **ESTELLE Based Reference Model Implementation for Validation of ISDN Conformace Testing.** NIST internal working paper.

Brady, Kevin; Keonig, Alfred L.; Hsing, Karen; **Network Management System for DoD Communications.** Submitted to Department of Defense Protocol Standards Technical Panel Working Group Four (Network Management).

Skall, Mark W.; **The Impact of Integrate '90 on the Utilization of Standards.** NCGA Forum, March/April 1990.

Wilson, Charles L.; Garris, Michael D.; **Handprinted Character Database.** National Standards Reference Data Series, April 1990.

Peng, Wendy; Wakid, Shukri; **A Standard Conformance Tester for X.25 DTE Implementations.** IEEE Networks, Vol. 3, No. 4, 1989.

Kuhn, D. Richard; **On the Effective Use of Software Standards in Systems Integration.** First International Conference on Systems Integration, April 1990.

Burrows, James H.; Radack, Shirley M.; **The Challenges of OSI Testing.** Proceedings of European Conference on Conformance Testing Certification in Information Technology and Telecommunications, May 1990.

Wong, William; Malpass, Peter; **Second Workshop on Integrated Software Engineering Environments.** Working Report, May 1990.

Radack, Shirley M.; **Compilation of Articles on NCSL Technical Activities.** Elsevier Science Publishers, May 1990.

Radack, Shirley M.; **More Effective Federal Computer Systems: The Role of NIST Standards.** Government Information Quarterly, 1990.

Roback, Edward A.; **Data Encryption Standard.** NCSL Bulletin, June 1990.

Wilson, Charles L.; **Self-Organizing Neural Network Character Recognition on Massively Parallel Computer.** Published for International Journal Conference on Neural Networks, June 17-21, 1990.

Harman, Donna K.; Candela, Gerald T.; **Retrieving Records From A Gigabyte Of Text On A Minicomputer Using Statistical Ranking.** Online Review, June 90.

Newton, Judith J.; **Developing and Applying Data Entity Naming Conventions.** Data Resource Management, June 1990.

Troy, Eugene F.; Flahavin, Ellen; **Guidance to Federal Agencies on the Use of Trusted Systems Technology.** NCSL Bulletin, July 1990.

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Newton, Judith; **Data Administration Management Association Symposium.** NIST Journal of Research, September/October 1990.

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Hong, Zhao; **As Associated Object Model for Distributed Systems.** Operating Systems Review, July 1990.

Lennon, Elizabeth B.; Roach, Ramona; **NIST Publication List 100, Open Systems Publications.** August 1990.

Wack, John P.; Kurzban, Stanley A.; **Computer Virus Attacks.** NCSL Bulletin, August 1990.

Hankinson, Allen L.; **Open System Standards for Applications Portability.** IEEE Proceedings, August 1990.

Moline, Judi; **Interactive Courseware as the Basis for Computer-Mediated Multimedia.** UNIX Technology Advisor, August 1990.

Moline, Judi; **Browsing in Hypertext: An Asset or a Liability?** To be published in 1991.

Lyons, Gordon E.; Snelick, Robert D.; **Workloads, Observables, Benchmarks and Instrumentation.** Joint International Conference, Zurich, Switzerland, September 10-13, 1990.

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Favreau, Jean-Philippe; Mills, Kevin L; Nightingale, Stephen; **The U.S. Gosip Testing Program.** Proceedings of the 6th International Conference on the Application of Standards for Open Systems, October 1990.

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Goldfine, Allen; **The Information Resource Dictionary System (IRDS); A Status Report.** Association for Federal Information Resources Management, Fall 1990.

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Gilbert, Dennis; **Review of Federal Agency Computer Security and Privacy Plans (CSPP): A Summary Report.** NCSL Bulletin, October 1990.

Mills, Kevin L.; **Standards and Trade: What's the Connection?** Proceedings of the 6th International Conference on the Application of Standards for Open Systems, October 1990.

Wilson, Charles L.; **A New Self-Organizing Neural Network Architecture for Parallel Multi-Map Pattern Recognition - FAUST.** Progress in Neural Networks, October 1990.

Katzke, Stuart W.; **A Framework for Computer Security Risk Management.** Proceedings for the Society for Risk Analysis, November 29, 1990.

Kemmerer, Sharon; **NIST Conformance Testing Programs Relevant to CALS.** Participant's Handout for the CALS Expo, Dallas, Texas, October 1990.

Glenn, Robert K.; **RDI-SIM: ECMA Inter-Domain Routing Protocol Simulation Tool.** 1990 IEEE, Global Telecommunications Conference & Exhibition, December 1990.

Furuta, Richard; Stotts, P. David; **A Functional Meta-Structure for Hypertext Models and Systems.** Electronic Publishing, December 1990.

Kuhn, Richard D.; Dray, James F.; **Formal Specifications and Verification of Control Software for Cryptographic Equipment.** Sixth Annual Computer Security Applications Conference, December 1990.

Chakrabarti, Chaitali; JaJa, Joseph; **VLSI Architectures for Template Matching and Block Matching.** Parallel Architectures and Algorithms for Image Understanding, 1990.

CONFERENCES AND WORKSHOPS

October 1989 - December 1990

1989

October 10-13	12th National Computer Security Conference (co-sponsored by the National Computer Security Center [NCSC])
November 1-2	Federal SHOWCASE '89 (co-sponsored by the IEEE Computer Society)
November 27	GOSIP Testing Workshop
December 11-15	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)

1990

January 16-18	Hypertext Standardization Workshop
March 6-9	North American ISDN Users' Forum
March 12-16	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
May 7-8	Data Administration Management Association Annual Symposium
May 9	Applications Portability Profile (APP) Workshop
May 31-June 1	Integrated Software Engineering Environments (ISEE) Workshop
June 18-22	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
June 26-28	COMPASS '90 (co-sponsored by the IEEE Aerospace & Electronics Systems Society and the IEEE National Capital Area Council)
July 30	Workshop on Electronic Information Exchange Standards Used in Document Processing Applications
August 6-9	North American ISDN Users' Forum
September 6	APP Shell & Application Utility Workshop
September 10-14	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)

September 18-20	Electronic Publishing '90 (co-sponsored by EPSIG American Association of Publishers, U. of Md. Institute for Advanced Computer Studies, Xerox Parc, IEEE, and in cooperation with ACM)
September 25-27	Fingerprint Image Workshop
October 1-4	13th National Computer Security Conference (co-sponsored by NCSC)
October 2-4	6th International Conference on Applications of Standards for Open Systems (co-sponsored by the IEEE Computer Society)
October 15	Workshop on Formatted Document Recognition
October 23	Lecture Series on High Integrity Systems
October 24-25	Department of Defense Electronic Data Interchange
October 29	Multi-Media Systems Workshop
November 5-8	North American ISDN Users' Forum
November 15	APP/Open Systems Environment (OSE) Workshop
December 10-14	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
December 17	Lecture Series on High Integrity Systems

PLANNED CONFERENCES AND WORKSHOPS

1991

January 22-23	Toward Federal Guidelines on Software Safety
January 23-24	Conformance Testing for Interactive Video Standard Practices
February 12	Lecture Series on High Integrity Systems
Feb 26-March 1	North American ISDN Users' Forum
March 11-16	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
March 22	Lecture Series on High Integrity Systems
April 9-10	Workshop on Security Labels
May 6-8	OSI Conformance Meeting
May 9	APP/OSE Workshop
May 14-15	Data Administration Management Association Annual Symposium
June 3	Lecture Series on High Integrity Systems
June 10-14	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
June 17-20	North American ISDN Users' Forum
June 20	Twenty-ninth Annual Technical Symposium (co-sponsored with ACM)
June 24-28	COMPASS '91 (co-sponsored by the IEEE Aerospace & Electronics Systems Society and the IEEE National Capital Area Council)
September 9-13	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)
October 1-4	14th National Computer Security Conference (co-sponsored by NCSC)
November 14	APP/OSE Workshop
December 9-13	NIST Workshop for Implementors of OSI (co-sponsored by the IEEE Computer Society)

TALKS

During the past two years, NCSL staff members presented papers at technical conferences and gave talks to a large number of external organizations, including the following:

ACM/NIST 28th Annual Technical Symposium
American National Standards Institute
American Society for Industrial Security
Association for Computing Machinery

Booz, Allen, and Hamilton, Federal Information Systems

CALS Workshops
Canadian Communications Security Establishment
Carnegie Mellon University
CASE Expo, Spring 1989
COMPASS '89 and '90 Annual Conferences on Computer Assurance
Computer Security Institute
Computer Integrated Manufacturing Conference
Corporation for Open Systems
Control, Audit & Security of Information Systems 10th Annual Conference

Data Administration Management Association
Data Interchange Standards Association
Data Processing Management Association Fourth Annual Computer Virus & Security Conference
DECUS Symposium
Defense Advanced Research Projects Agency (DARPA)
Defense & Government Computer Graphics Conference
Department of Commerce
Department of Defense
Department of Health and Human Services
Digital Equipment Corporation

Eastern Small College Computing Conference
EDP Auditors Association
Electronic Image Management for Government Second National Conference
Entity Relationship User's Group

Federal ADP Users Group
Federal CASE Conference 1989
Federal Computer Conference
Federal Data Management Users Group
Federal Office Systems Expo
Federal Open Systems Conference 1990
Federal Personnel Automation Forum
Federal ShowCASE '90
Federal Software Maintenance Group
Federation of Government Information Processing Councils
FedUNIX '90
FORTE '90 Conference on Formal Description Techniques for Distributed Systems and Communications Protocols, Madrid, Spain

General Motors Research Laboratory
General Services Administration
George Washington University
Government Computer News
Government Technology Conference and Exposition
Graphics Users Workshop

Hewlett Packard
Honeywell Federal Systems Division

INFORUM
Institute for Supercomputing Research of Japan
Institute of Electrical and Electronic Engineers (IEEE)
Institute of Engineers, Australia Conference
Institut National de Telecommunications, Evry, France
Interagency Working Group on Management of Data for Global Change
Internal Revenue Service
International Data Administration Symposium
International Joint Conference on Neural Networks
International Neural Network Society

Joint Data Standardization Conference
Joint International Conference on Vector and Parallel Processing, Zurich, Switzerland

Los Alamos National Laboratory

MAP/TOP Users Group
MITRE Corporation

National Aeronautics and Space Administration
National Archives and Records Administration
National Association of State Election Directors
National Communications Forum, Chicago
National Computer Graphics Association
National Computer Security Center
National Computer Security Conference
National Contract Management Association
National Endowment for the Humanities
National Science Foundation
Natural Science and Engineering Research Council of Canada
NIST Applications Portability Profile Workshops
NIST Fingerprint Image Analysis Workshop
NIST GOSIP Users' Workshop
NIST Workshops for Implementors of OSI
North American Integrated Services Digital Network Users' Forum

Ohio Supercomputing Research Center
Open Software Foundation

POSIX Implementors Workshop

Quality Assurance Institute

Second National Conference on Optical Storage Laws and Regulations
Sixth Annual Specialty Paper and Films Conference, Diamond Research Corporation
Sixth International Conference on Standards for Open Systems
Smithsonian Seminar on Scientific Imaging
Standards for Computer Integrated Manufacturing Conference
Symposium on High-Speed Telecommunications and Integrated Hospital Imagery

Tenth International IFIP WG6.1 Symposium on Protocol Specification, Testing, and Verification
Thirteenth International Conference on Research and Development in Information Retrieval

Unigraphics Users Group
University of Arizona
University of Maryland
UNIX International

X/OPEN

ELECTRONIC BULLETIN BOARDS

NCSL operates four electronic bulletin boards for information exchange:

Information about computer security	(301) 948-5717
Information about data management activities and applications	(301) 948-2048 and 948-2059
Information about Open Systems Interconnection standards activities	(301) 869-8630
Information about the North American Integrated Services Digital Network (ISDN) Users' Forum	(301) 869-7281

NIST operates the following bulletin board:

Information about the Computer-aided Acquisition and Logistic Support (CALS) Program	(301) 921-9842 and 948-7438

Users can reach the bulletin boards by dialing the numbers listed above. Terminals should have the following capabilities:

ASCII, 300, 1200, or 2400 baud, 8 bits with no parity or 7 bits with even parity, 1 stop bit.

If a connection is not established at the end of two rings or if the line is busy, hang up and try again.

After "CONNECT" strike the carriage return twice and the system will be accessed. The system will now guide you through the bulletin board by asking key questions and providing helpful menus.

USER GROUPS SPONSORED BY NCSL

The **NIST Workshop for Implementors of Open Systems Interconnection (OSI)** meets four times a year to discuss detailed implementation specifications for OSI standards.

CONTACT: Tim Boland
B-217 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899
Telephone: (301) 975-3608

The joint **ISDN Users' Workshop and ISDN Implementors Workshop of the North American ISDN Users' Forum** meets four time a year to address application requirements and to develop application profiles for ISDN products and services.

CONTACT: Dawn Hoffman
B-364 Materials Building
National Institute of Standards and Technology
Gaithersburg, MD 20899
Telephone: (301) 975-2937

Applications Portability Profile/POSIX Workshops meet to discuss the development of an architectural approach to applications portability and to review proposed revisions to the POSIX standard.

CONTACT: James Hall
B-266 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899
Telephone: (301) 975-3273

The **Graphics in Government (GIG) Users' Group** focuses on the specific and unique graphics technology needs of federal agencies, increases communication among agencies, and advises government managers and users about current and planned activities to assist agencies in the area of graphics technology and standards.

CONTACT: Daniel Benigni
A-266 Technology Building
National Institute of Standards and Technology
Gaithersburg, MD 20899
Telephone: (301) 975-3266

FIPS PUBLICATIONS LIST BY FIPS NUMBER

1990 December

FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
0	(1) P	General Description of FIPS Register 68 Nov 01	
1-2	(2&3) S	Code for Information Interchange, Its Representations, Subsets, and Extensions (ANSI X3.4-1977, X3.32-1973, X3.41-1974) 84 Nov 14	
2-1	(2) S	Perforated Tape Code for Information Interchange (ANSI X3.6-1965/R1983) 84 Nov 14	
3-1	(2) S	Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI) (ANSI X3.22-1973) 73 June 30	
4-1	(4) S	Representation for Calendar Date and Ordinal Date for Information Interchange (ANSI X3.30-1985) 88 Jan 27	
5-2	(4) S	Codes for the Identification of the States, the District of Columbia and the Outlying Areas of the United States, and Associated Areas 87 May 28	1
*6-4	(4) S	Counties and Equivalent Entities of the United States, Its Possessions, and Associated Areas 90 Aug 31	
7		WITHDRAWN	1
8-5	(4) S	Metropolitan Statistical Areas (MSAs) (Including CMSAs, PMSAs, and NECMAs) 84 Oct 31	6
*9-1	(4) S	Congressional Districts of the U.S. 90 Nov 30	

*Approved in 1990

Category Key: **(1)** General Publications **(2)** Hardware Standards/guidelines **(3)** Software Standards/guidelines **(4)** Data Standards/guidelines **(5)** ADP Operations Standards/guidelines **(6)** Related Telecommunications Standards **(7)** Conformance Tests

S-Standard **G**-Guideline **P**-Program Information Document **T**-Conformance Tests

FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
10-3	(4) S	Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Admin. Divs. 84 Feb 09	8
11-2	(3) G	Guideline: American National Dictionary for Inform. Processing Systems (X3/TR-1-82) 83 May 09	
12-2		WITHDRAWN	1
13	(2) S	Rectangular Holes in Twelve-Row Punched Cards (ANSI X3.21-1967/R1980) 71 Oct 01	
14-1	(2) S	Hollerith Punched Card Code (ANSI X3.26-1980) 80 Dec 24	
15		WITHDRAWN	1
16-1	(6) S	Bit Sequencing of Code for Information Interchange in Serial-By-Bit Data Transmission (ANSI X3.15-1976/R1983) 77 Sept 01	
17-1	(6) S	Character Structure and Char. Parity Sense for Serial-By-Bit Data Communication in the Code for Inform. Interchg. (ANSI X3.16-1976/R1983) 77 Sept 01	
18-1	(6) S	Character Structure and Char. Parity Sense for Parallel-By-Bit Data Communication in the Code for Inform. Interchg. (ANSI X3.25-1976/R1983) 77 Sept 01	
19-1	(4) G	Catalog of Widely Used Code Sets 85 Jan 07	2
20		WITHDRAWN	1
*21-3	(3) S	COBOL (ANSI X3.23-1985 & X3.23A-1989) 90 Jan 12	1

*Approved in 1990

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
22-1	(6) S	Synchronous Signaling Rates Between Data Terminal and Data Communication Equip. (ANSI X3.1-1976) 77 Sept 01	
23		WITHDRAWN	1
24		WITHDRAWN	1
25	(2) S	Recorded Magnetic Tape for Information Interchg. (1600 CPI, Phase Encoded) (ANSI X3.39-1973) 73 June 30	
26	(2) S	One-Inch Perforated Paper Tape for Information Interchange (ANSI X3.18-1967/R1974&1982) 73 June 30	
27	(2) S	Take-Up Reels for One-Inch Perforated Tape for Information Interchg. (ANSI X3.20-1967/R1982) 73 June 30	
28	(4) P	Standardization of Data Elements and Representations 73 Dec 05	1
29-2	(1&3) P	Interpretation Procedures for Federal Information Processing Standards for Software 87 Sept 14	
30	(3) S	Software Summary for Describing Computer Programs and Automated Data Systems 74 June 30	
31	(5) G	Guidelines for Automatic Data Processing Physical Security and Risk Management 74 June--	
32-1	(2) S	Character Sets for Optical Char. Recognition (OCR) (ANSI X3.2-1970/R1976,X3.17-1981,X3.49-1975/R1982) 82 June 25	
33-1	(2) S	Character Set for Handprinting (ANSI X3.45-1982) 84 Nov 05	

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S-Standard **G**-Guideline **P**-Program Information Document **T**-Conformance Tests

FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
34	(1) P	Guide for the Use of International System of Units (SI) in Federal Information Processing Standards Publications 75 Jan 01	
35		WITHDRAWN	1
36		WITHDRAWN	1
37		WITHDRAWN	1
38	(3) G	Guidelines for Documentation of Computer Programs and Automated Data Systems 76 Feb 15	
39	(5) G	Glossary for Computer Systems Security 76 Feb 15	
40	(2) G	Guideline for Optical Character Recognition Forms 76 May 01	
41	(5) G	Computer Security Guidelines for Implementing the Privacy Act of 1974 75 May 30	
42-1	(5) G	Guidelines for Benchmarking ADP Systems in the Competitive Procurement Environment 77 May 15	
43		WITHDRAWN	1
44		WITHDRAWN	1
45	(4) G	Guide for the Development, Implementation & Maintenance of Standards for the Representation of Computer Processed Data Elements 76 Sept 30	
46-1	(5) S	Data Encryption Standard 88 Jan 22	
47		WITHDRAWN	1
48	(5) G	Guidelines on Evaluation of Techniques for Automated Personal Identification 77 Apr 01	

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S-Standard **G**-Guideline **P**-Program Information Document **T**-Conformance Tests

FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
49	(5) G	Guideline on Computer Performance Management: An Introduction 77 May 01	
50	(2) S	Recorded Magnetic Tape for Information Interchange, 6250 cpi (246 cpmm), Group Coded Recording (ANSI X3.54-1976) 78 Feb 01	
51	(2) S	Magnetic Tape Cassettes for Information Interchange (3.810 mm [0.150 in] Tape at 32 bpmm [800bpi],PE) (ANSI X3.48-1977) 78 Feb 01	
52	(2) S	Recorded Magnetic Tape Cartridge for Inform. Interchange., 4-Track, 6.30 mm (1/4in), 63 bpmm (1600 bpi), Phase Encoded (ANSI X3.56-1977) 78 July 15	
53	(3) S	Transmittal Form for Describing Computer Magnetic Tape File Properties 78 Apr 01	
54	(2) S	Computer Output Microform (COM) Formats and Reduction Ratios, 16mm and 105mm 78 July 15	
55DC-4	(4) G	Guideline: Codes for Named Populated Places Primary County Divisions, and Other Locational Entities of the United States and Outlying Areas 87 Jan 16	1
55-2	(4) G	Same as 55DC except without codes 87 Feb 03	1
56	(5) G	Guideline for Managing Multivendor Plug-Compatible ADP Systems 78 Sept 15	
57	(5) G	Guidelines for the Measurement of Interactive Computer Service Response Time and Turnaround Time 78 Aug 01	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
58-1	(4) S	Representations of Local Time of the Day for Information Interchange (ANSI X3.43-1986) 88 Jan 27	
59	(4) S	Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange (ANSI X3.51-1975) 79 Feb 01	
60-2	(2) S	I/O Channel Interface 83 July 29	2
61-1	(2) S	Channel Level Power Control Interface 82 July 13	1
62	(2) S	Operational Specification for Magnetic Tape Subsystems 79 Feb 16 2+F.R. notice	
63-1	(2) S	Operational Specification for Variable Block Rotating Mass Storage Subsystems 83 Apr 14	1
63-1 SUPPLEMENT		Additional Operational Specs for VBRMSS 83 Apr 14	1
64	(3) G	Guidelines for Documentation of Computer Programs and Automated Data Systems for the Initiation Phase 79 Aug 01	
65	(5) G	Guideline for Automatic Data Processing Risk Analysis 79 Aug 01	
66	(4) S	Standard Industrial Classification (SIC) Codes 79 Aug 15	
67	(2) G	Guideline for Selection of Data Entry Equipment 79 Sept 30	
68-2	(3) S	BASIC (ANSI X3.113-1987) 87 Aug 28	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
69-1	(3) S	FORTRAN (ANSI X3.9-1978) 85 Dec 24	
70-1	(4) S	Representation of Geographic Point Locations for Information Interchange (ANSI X3.61-1986) 86 Nov 14	
71	(6) S	Advanced Data Communication Control Procedures (ADCCP) (ANSI X3.66-1979) 80 May 14	1
72	(5) G	Guidelines for Measurement of Remote Batch Computer Service 80 May 01	
73	(5) G	Guidelines for Security of Computer Applications 80 June 30	
74	(5) G	Guidelines for Implementing and Using the NBS Data Encryption Standard 81 Apr 01	
75	(5) G	Guideline on Constructing Benchmarks for ADP System Acquisitions 80 Sept 18	
76	(3) G	Guideline for Planning and Using a Data Dictionary System 80 Aug 20	
77	(3) G	Guideline for Planning and Management of Database Applications 80 Sept 01	
78	(6) G	Guideline for Implementing Advanced Data Communication Control Procs (ADCCP) 80 Sept 26	
79	(3) S	Magnetic Tape Labels and File Structure for Information Interchange (ANSI X3.27-1978) 80 Oct 17	
80		WITHDRAWN	1
81	(5) S	DES Modes of Operation 80 Dec 02	1

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
82	(2) G	Guideline for Inspection and Quality Control for Alphanumeric Computer-Output Microforms (AIIM (NMA) MS1-1980) 80 Sept 26	
83	(5) G	Guideline on User Authentication Techniques for Computer Network Access Control 80 Sept 29	
84	(2) S	Microfilm Readers (ANSI/AIIM(NMA) MS20-1979) 80 Oct 31	
85	(2) S	Optical Character Recognition (OCR) Inks (ANSI X3.86-1980/R1987) 80 Nov 07	
86	(2) S	Additional Controls for Use with Amer. Natl. Std. Code for Inform. Interchg. (ANSI X3.64-1979) 81 Jan 29	2
87	(5) G	Guidelines for ADP Contingency Planning 81 Mar 27	
88	(3) G	Guideline on Intregity Assurance and Control in Data-base Administration 81 Aug 14	
89	(2) S	Optical Character Recognition (OCR) Character Positioning (ANSI X3.93M-1981) 81 Sept 04	
90	(2) G	Guideline for Optical Character Recognition (OCR) Print Quality (ANSI X3.99-1983) 83 Sept 29	
91		WITHDRAWN	1
92	(4) G	Guideline for Standard Occupational Classification (SOC) Codes 83 Feb 24	
93	(2) S	Parallel Recorded Magnetic Tape Cartridge for Information Interchange, 4-Track, 6.30 mm (1/4 in), 63 bpmm (1600 bpi), Phase Encoded (ANSI X3.72-1981/R1987) 82 June 29	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
94	(2) G	Guideline on Electrical Power for ADP Installations 83 Sept 21	
95	(4) S	Codes for the Identification of Federal and Federally-Assisted Organizations 82 Dec 23	24
96	(5) G	Guideline for Developing and Implementing a Charging System for Data Processing Services 82 Dec 06	
97	(2) S	Operational Specifications for Fixed Block Rotating Mass Storage Subsystems 83 Feb 04	1
98		WITHDRAWN	2
99	(3) G	Guideline: A Framework for the Evaluation and Comparison of Software Development Tools 83 Mar 31	
100	(6) S	Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Operation with Packet-Switched Data Communications Networks 83 July 06	
101	(3) G	Guideline for Lifecycle Validation, Verification, and Testing of Computer Software 83 June 06	
102	(5) G	Guideline for Computer Security Certification and Accreditation 83 Sept 27	
103	(4) S	Codes for the Identification of Hydrologic Units in the United States and the Caribbean Outlying Areas (USGS/CIRCULAR #878-A& ANSI X3.145-1986) 83 Nov 15	1
104-1	(4) S	ANS Codes for the Representation of Names of Countries, Dependencies, and Areas of Special Sovereignty for Information Interchange 86 May 12	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
105	(3) G	Guideline for Software Documentation Management 84 June 06	
106	(3) G	Guideline on Software Maintenance 84 June 15	
107	(2&3) S	Local Area Networks: Baseband Carrier Sense Multiple Access with Collision Detection Access Method and Physical Layer Specifications and Link Layer Protocol (ANSI/IEEE 802.2&802.3) 84 Oct 31	
108	(2) S	Alphanumeric Computer Output Microform Quality Test Slide (AIIM MS28-1983) 84 Nov 05	
109	(3) S	Pascal (ANSI/IEEE 770X3.97-1983) 85 Jan 16	
110	(3) G	Guideline for Choosing a Data Management Approach 84 Dec 11	
111	(2) S	Storage Module Interfaces (w/extens. for enhanced storage module interfaces) (ANSI X3.91M-1982) 85 Apr 18	1
112	(5) S	Password Usage 85 May 30	
113	(5) S	Computer Data Authentication 85 May 30	
114	(2) S	200 mm (8in) Flexible Disk Cartridge Track Format Using Two-Frequency Modulation Recording at 6631 bprad on One Side - 1.9 tpmm (48 tpi) for Information Interchange (ISO 5654/2) 85 Sept 30	
115	(2) S	200 mm (8in) Flexible Disk Cartridge Track Format Using Modified Frequency Modulation Recording at 13262 bprad on Two-Sides - 1.9 tpmm (48 tpi) for Information Interchange (ISO 7065/2) 85 Sept 30	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
116	(2) S	130 mm (5.25 in) Flexible Disk Cartridge Track Format Using Two-Frequency Recording at 3979 bprad on One Side - 1.9 tpmm (48 tpi) for Information Interchange (ISO 6596/2) 85 Sept 30	
117	(2) S	130 mm (5.25 in) Flexible Disk Cartridge Track Format Using Modified Frequency Modulation Recording at 7958 bprad on two sides - 1.9 tpmm (48 tpi) for Information interchange (ISO 7487/3) 85 Sept 30	
118	(3) S	Flexible Disk Cartridge Labelling and File Structure for Information Interchange (ISO 7665) 85 Sept 30	
119	(3) S	Ada (ANSI/MIL-STD-1815A-1983) 85 Nov 08	1
120	(3) S	Graphical Kernel System (GKS) (ANSI X3.124-1985) 86 Apr 18	
121	(2&3) S	Videotex/Teletext Presentation Level Protocol Syntax (North American PLPS) (ANSI X3.110-1983/CS T500-1983) 86 May 06	
122	(7) T	Conformance Tests for FIPS PUB 100 Version of CCITT 1980 Recommendation X.25, etc. 86 May 28	
123	(3) S	Specification for a Data Descriptive File for Information Interchange (DDF) (ANSI/ISO 8211-1985) 86 Sept 19	
124	(3) G	Guideline on Functional Specifications for Database Management Systems 86 Sept 30	
125	(3) S	MUMPS (ANSI/MDC X11.1-1984) 86 Nov 4	
126	(3) S	Database Language NDL (ANSI X3.133-1986) 87 Mar 10	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
*127-1	(3) S	Database Language SQL (ANSI X3.135-1989 & X3.168-1989) 90 Feb 02	
128	(3) S	Computer Graphics Metafile (CGM) (ANSI X3.122-1986) 87 Mar 16	
129	(2) S	Optical Character Recognition (OCR) - Dot Matrix Character Sets for OCR-MA (ANSI X3.111-1986) 87 May 06	
130	(2) S	Intelligent Peripheral Interface (IPI) (ANSI X3.129-1986, X3.130-1986, X3.132-1987, and X3.147-1987) 87 July 16	1
131	(2) S	Small Computer System Interface (SCSI) (ANSI X3.131-1986) 87 July 16	1
132	(3) G	Guideline for Software Verification and Validation Plans (ANSI/IEEE 1012-1986) 87 Nov 19	
133	(6) S	Coding and Modulation Requirements for 2,400 Bit/Second Modems 86 June 02	
134-1	(6) S	Coding and Modulation Requirements for 4800 Bit/Second Modems 88 Nov 04	
135	(6) S	Coding and Modulation Requirements for Duplex 9600 Bit/Second Modems 81 March	
136	(6) S	Coding and Modulation Requirements for Duplex 600 and 1200 Bit/Second Modems 80 June 16	
137	(6) S	Analog to Digital Conversion of Voice by 2,400 Bit/Second Linear Predictive Coding 84 Nov 28	
138	(6) S	Electrical Characteristics of Balanced Voltage Digital Interface Circuits 75 Sept 24	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
139	(6) S	Interoperability and Security Requirements for Use of the Data Encryption Standard in the Physical Layer of Data Communications 83 Aug 3	
140	(6) S	General Security Requirements for Equipment Using the Data Encryption Standard 82 Apr 14	
141	(6) S	Interoperability and Security Requirements for Use of the Data Encryption Standard with CCITT Group 3 Facsimile Equipment 85 Apr 04	
142	(6) S	Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits 80 Jan 31	
143	(6) S	General Purpose 37-Position 9-Position Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment 85 June 10	
144	(6) S	Data Communication Systems and Services User-Oriented Performance Parameters 85 May 28	
145		WITHDRAWN	
146	(2&3) S	Government Open Systems Interconnection Profile (GOSIP) 88 Aug 24	
147	(6) S	Group 3 Facsimile Apparatus for Document Transmission 81 Aug 19	
148	(6) S	Procedures for Document Facsimile Transmission (EIA-RS-466) 82 Apr 14	
149	(6) S	General Aspects of Group 4 Facsimile Apparatus (EIA-536-1988) 88 Nov 04	

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FIPS NO.	CATEGORY	TITLE-DATE	CHANGE NOTICES
150	(6) S	Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus (EIA-538-1988) 88 Nov 04	
*151-1	(3) S	POSIX: Portable Operating System Interface for Computer Environments (IEEE 1003.1-1988) 90 Mar 28	
152	(3) S	Standard Generalized Markup Language (SGML) (ISO 8879-1986) 88 Sept 26	
**153	(3) S	Programmer's Hierarchical Interactive Graphics System (PHIGS) (ANSI X3.144-1988) 88 Oct 14	
154	(6) S	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment (EIA-530-1987) 88 Nov 04	
155	(6) S	Data Communication Systems and Services User-Oriented Performance Measurement Methods (ANSI X3.141-1987) 88 Nov 04	
156	(3) S	Information Resources Dictionary System (IRDS) (ANSI X3.138-1988) 89 Apr 05	
157	(2) G	Guideline for Quality Control of Image Scanners 89 Sept 13	
*158	(3) S	The User Interface Component of the Applications Portability Profile (MIT X Version 11, Release 3) 90 May 29	
*159	(6) S	Detail Specification for 62.5-μM Core Diameter/125-μM Cladding Diameter Class Ia Multimode, Graded-Index Optical Waveguide Fibers 90 Dec 27	

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The National Computer Systems Laboratory Annual Report - 1990 describes the annual computer and related telecommunications activities and accomplishments of the Laboratory. Following the Director's Foreword, an overview of the Laboratory is presented, including a current NCSL Organization Chart and selected staff accomplishments. Overviews of NCSL's five technical divisions are featured next, followed by a section on Technology Transfer which details the vehicles NCSL uses to disseminate research and information to the public and technical communities. A list of Federal Information Processing Standards (FIPS) and FIPS order information conclude the annual report.

12. KEY WORDS (6 TO 12 ENTRIES; ALPHABETICAL ORDER; CAPITALIZE ONLY PROPER NAMES; AND SEPARATE KEY WORDS BY SEMICOLONS)

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